MIDWEST ENGINEER

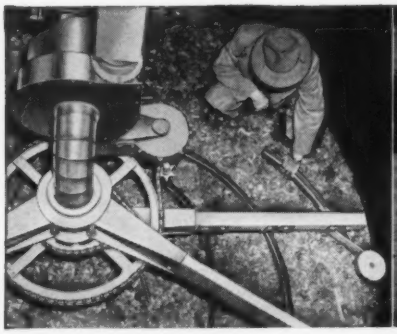
WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

Story of the Diesel — New York Stock Exchange — How a Hat Is Made

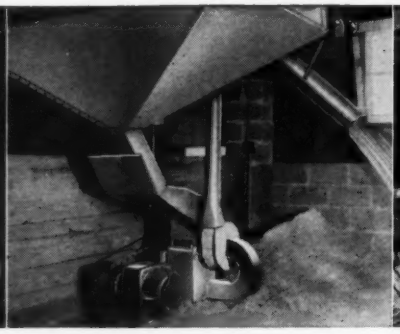
VOL. 1 NOVEMBER, 1948 NO. 3

IT'S A "PUSH-BUTTON" FARM AGE IN NORTHERN ILLINOIS

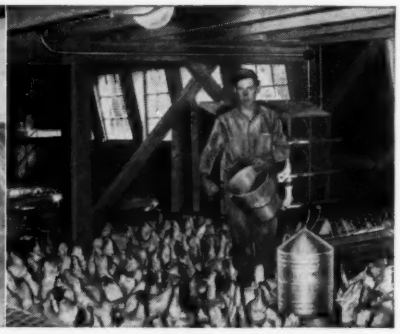
With electricity available to 96 per cent of its farms, Northern Illinois is pioneering and developing many progressive farming methods. Close cooperation of our trained agricultural engineers with manufacturers, farm organizations and farmers themselves has resulted in numerous labor-saving innovations which are increasing production and making the farmer's job easier. Below are a few of these developments.



***SILO UNLOADING** is a snap with this automatic unloader which claws the silage loose, then blows it down to a feed cart below while the farmer is doing another chore. Saves five days of work a month on many farms!*



***FEED GRINDING AND MIXING** for cattle, sheep and poultry is another "push-button" job. With grinder, mixer and well-placed chutes and bins, you just put in the right ingredients, and flick the switch . . . the job's done.*



***EGG PRODUCTION** is up, with time-controlled lighting, water warmers, and poultry-house ventilators. These aids all contribute to increased egg volume in the fall and early winter when prices are highest.*

***WATER** when and where needed, and in the right amounts, is provided by "push-button" irrigation. Overhead, open ditch, or lightweight on-the-ground pipe systems make truck gardeners independent of the weatherman.*

***HAY DRYING SYSTEMS** permit speedy mowing away of leafy, green, high-moisture and vitamin content hay . . . the kind that produces more milk. It is efficiently dehydrated by air forced through ducts in the mow.*

***PORK PRODUCTION PROFITS** begin at farrowing time! Electric pig-brooders help more pigs reach weaning age . . . help decrease the 33⅓ per cent pig mortality rate, and send more pork to markets for sale and profit.*

Forty per cent of America's farm output, in dollar value, is produced in—or within an overnight ride of—Northern Illinois. Chicago has become the hub of the world's greatest packing and food storage industry, as well as the largest single live animal market. Because the Middle West is the nation's granary, Chicago and Northern Illinois is a huge grain distributing center. As focal point for the nation's transportation network, the food wealth of the fertile upper Mississippi prairies and livestock from the western ranges flow into this area. Agriculture and industry are partners in Chicago and Northern Illinois.

This is one of a series of advertisements on the industrial, agricultural and residential characteristics of Chicago and Northern Illinois

TERRITORIAL INFORMATION DEPARTMENT

Marquette Building—140 South Dearborn Street, Chicago 3, Illinois—Phone RANdolph 1617

COMMONWEALTH EDISON COMPANY • PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS

WESTERN UNITED GAS AND ELECTRIC COMPANY • ILLINOIS NORTHERN UTILITIES COMPANY

MIDWEST ENGINEER
Published Monthly
except June, July, August by
THE WESTERN
SOCIETY OF ENGINEERS
at
2207 Dodge Avenue
Evanston, Illinois

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BARBARITA M. ANDREWS
Production Supervisor

GENERAL AND EDITORIAL OFFICES
84 E. RANDOLPH STREET
CHICAGO 1, ILLINOIS
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Single copy.....$ .35
Annual subscription.....3.00
Foreign postage.....1.00
(Additional, per year)

Entered as second-class matter September 23, 1948 at the post office at Evanston, Illinois under the Act of March 3, 1879.

MIDWEST ENGINEER

A Publication of

THE WESTERN SOCIETY OF ENGINEERS

Serving the Engineering Profession

November 1, 1948

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COVER CREDIT

The experimental train shown on our cover, is packed full of mechanical marvels, new-as-tomorrow interior decoration and many postwar features for the comfort and safety of passengers, and is designed by General Motors. Powered by a GM Electro-motive Diesel locomotive, the cars—day coach, diner, sleeper and observation lounge—are of an entirely new design that permits an astra dome atop each for unrivalled view of landscape, and a depressed car floor beneath, resulting in four floor-levels in every car, with ramps or steps connecting them.

COMING IN THE DECEMBER ISSUE:

PROGRAMMED PROGRESS FOR HIGHWAYS

THE ILLINOIS ROAD BUILDERS ASSOCIATION

THE VOICE OF BUSINESS IN ILLINOIS

Illinois Institute of Technology
Technology Center, Chicago 16

Department of Civil Engineering October 11, 1948

"As a newcomer to Chicago and an applicant for admission to membership in the Western Society of Engineers, I was pleased to receive a copy of the MIDWEST ENGINEER.

"Examination disclosed a well-balanced, interesting and attractive magazine. It was quite a surprise to see such a high quality publication labeled Volume 1, Number 2. You have made an excellent start in a new venture. Congratulations!"

F. W. EDWARDS, *Director*
Dept. of Civil Engineering

The Franklin Institute
of the State of Pennsylvania
Philadelphia 3, Pennsylvania

September 29, 1948

"I have received the first issue of your new publication MIDWEST ENGINEER, for which I thank you.

"I wish to congratulate you on the fine appearance of your new journal, and you may feel assured that it will be welcomed by many persons in the engineering field."

WALTER A. R. PERTUCH,
Librarian

Stanford Research Institute
Stanford, California

September 28, 1948

"I was happy indeed to have your letter of September tenth and to see Volume 1, Number 1 of the MIDWEST ENGINEER.

"This represents a real advance in your program. It is an excellent publication, and I am sure it will do a great deal for the Western Society of Engineers.

"I regret that I am now so far away that I am not in contact with your development program, but you may be sure of my continued interest."

J. E. HOBSON,
Executive Director

American Society for Testing Materials
1916 Race Street
Philadelphia 3, Pa.

September 24, 1948

"You may be sure that we reviewed with considerable interest the first copy of your MIDWEST ENGINEER, and we were very favorably impressed. You have done an excellent job in putting the first number together, and I am sure that the other ones will be just as interesting and worthwhile from the standpoint of all the activities of the Western Engineers. . . . "

ROBERT J. PAINTER
Assistant Secretary

Kight Advertising
118 N. Third Street
Columbus 15, Ohio

September 27, 1948

"We have been asked by the president of the Ohio State chapter of the American Institute of Industrial Engineers, whose national headquarters are also located here in Columbus, to obtain data for them on publishing a magazine in their field.

"Having just received the first issue of your publication, MIDWEST ENGINEER, and finding it a notable job indeed, we are very much interested in the various phases of producing such a magazine. . . .

"Let me say again that we think you have done a very good job of make-up and content on your first issue, and we certainly wish you all kinds of success in future issues. . . . "

(MRS.) E. W. KIGHT,
Secretary-Treasurer

Rogers and Slade
Management Consultants
342 Madison Avenue
New York 17, N. Y.

"Thank you for the copy of your new magazine, MIDWEST ENGINEER, which you had promised in your letter of August 26. I have reviewed it with a great deal of interest and pleasure. You have done an excellent job and one in which your membership can take real pride."

RALPH K. ROGERS

SUBSCRIPTION BLANK

THE WESTERN SOCIETY OF ENGINEERS

To the Development Committee: I desire to contribute the sum of $_____ toward the expense to be incurred in the expansion program associated with moving our headquarters to the Crerar site, 84 East Randolph Street, on April 1, 1948. My contribution will be:

☐ In full herewith.

☐ In installments as follows:

_____ _____
Signature *Date*

$_____ *on or before* _____

$_____ *on or before* _____

Please make checks payable to

The Western Society of Engineers

The Story of the Diesel

Harvey T. Hill
Executive Director, Diesel Engine Manufacturers Association, Chicago

This seems an appropriate time and place to be writing about Diesel engines. The time is apropos because 1948 marks the 50th anniversary of the first commercial application of the Diesel in the United States. The place also seems fitting, because 75 per cent of the nation's total Diesel engine output is located within 400 miles of Chicago.

Further, the sweep of such a radius would catch every known application of the Diesel—main line locomotive, industrial locomotive, bus, truck, tractor, power house, industrial power unit, boat, and construction machinery. The engines produced would range in horsepower from five to 8,500.

Because the midwest is the center of the Diesel engine industry of the United States, our association moved its headquarters from New York to Chicago four years ago.

The technical and engineering phases of the Diesel engine have often been written about. The editor of MIDWEST ENGINEER has suggested that because there is considerable human interest in the non-technical story of the Diesel, that I touch upon those aspects. It would seem fitting, in that case, to consider first the engine's origin.

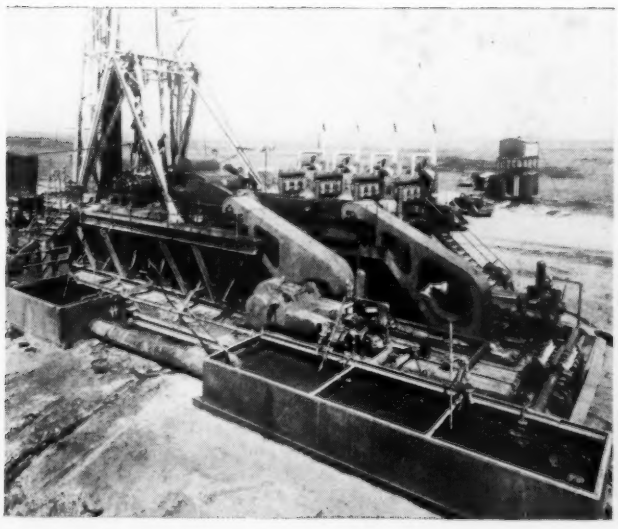
Origin

Dr. Rudolf Diesel, a German scientist, is credited with the invention of the engine that bears his name. Though other scientists before him had been working toward the ultimate result for years, it was Diesel who gathered together and correlated their findings, evolving the Diesel engine which he patented in 1892. He tried powdered coal in his earlier engines to produce combustion, but he soon abandoned this in favor of fuel oil, which is used today.

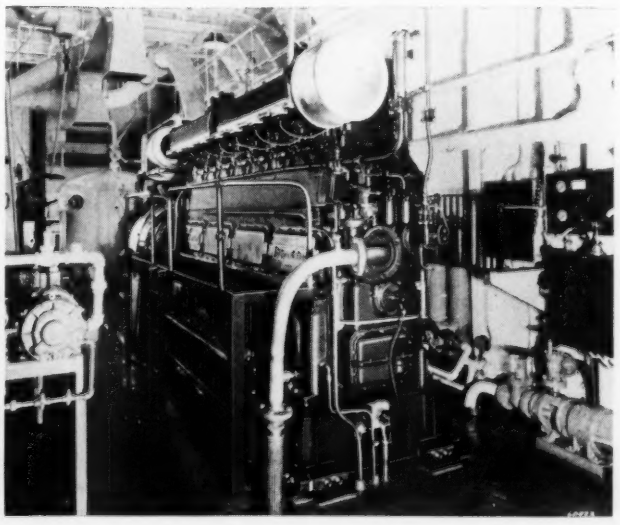
One of Diesel's early engines exploded, all but costing the inventor his life. However, he was encouraged, rather than downcast, over the mishap because it proved that the engine had ample

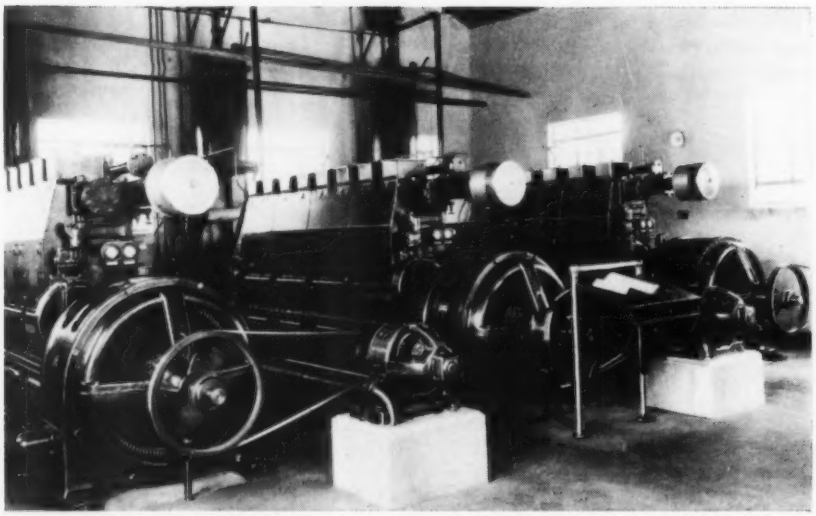
(*Continued on Page* 4)

Ideal Type 125 Consolidated Rig in 136′ Ideco Cantilever Mast 4 Superior PTD-6 Diesel Engines; 2 Ideal C-350 Power Pumps in the California field. National Supply Company.



Eight cyl. Type S Diesel engine marine generating set on board the steamship Nightingale. This C-2 Maritime Commission ship is operated between New York and South American points by the Grace Co. Ingersoll-Rand Company.





1. Tow Boat, Fort Dearborn. Showing one of two 1600 opposed piston Fairbanks-Morse Diesels.

2. Tow Boat, Fort Dearborn. Power by Fairbanks-Morse Diesels.

3. The 8 cylinder Type S Engines with General Electric Generators installed in the South American oil fields. Ingersoll-Rand Company.

The Story of the Diesel

(Continued from Page 3)

power. What was needed was to safely house that power and apply it usefully.

It was not until 1898 that the first Diesel engine was put to work successfully in this country. In September of that year, Adolphus Busch, who had purchased from Diesel the patent rights of the engine for use in the United States, installed one in his brewery in St. Louis. Its job was to generate current for lighting the plant. The engine was, of course, crude by any present-day standard of comparison. It was a ponderous, two-cylinder affair, set in an "A" frame, and weighing 450 pounds to the horsepower. It is regrettable that this engine was not preserved for posterity. Inadvertently it was destroyed, thus depriving it of a place in a historical museum.

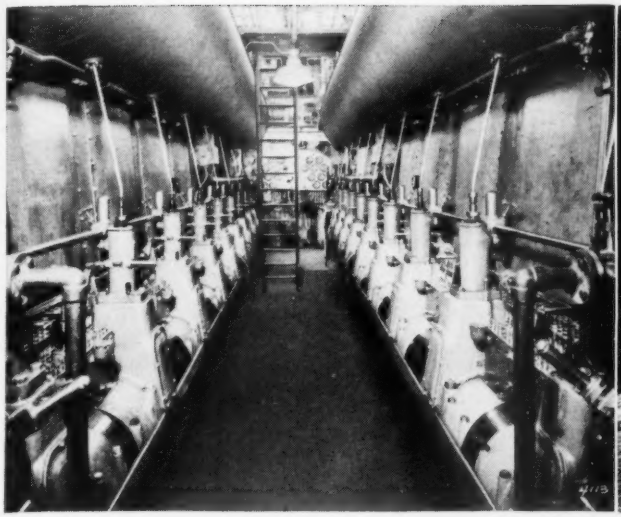
Early Development

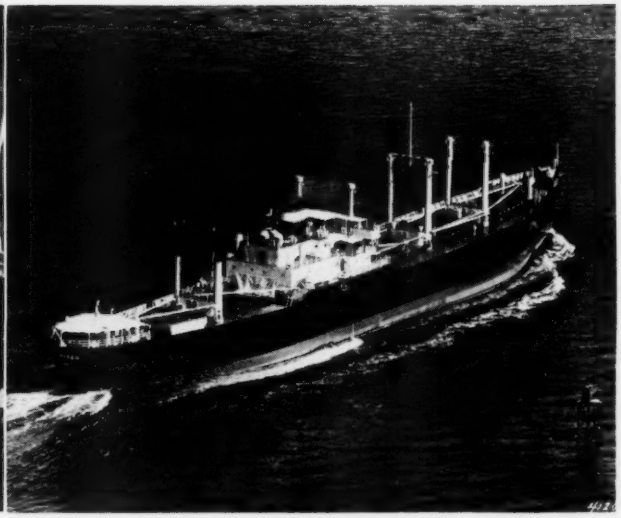
During the first decade of the present century, use of the Diesel grew slowly, its fields of application being decidedly limited. An early installation was that of generating current in a municipally owned power plant in New England. There were a few industrial applications here and there, but in the main the Diesel was still feeling its way.

The second decade brought with it both the death of Dr. Diesel, and World War I with its marked increase in the use of the engine. The Doctor died in 1913, disappearing off shipboard, during the night, while crossing the English Channel. With the first World War came a demand for Diesel engines to propel our submarines. 150,000 horsepower of Diesel engines was employed for this purpose. By now the engine had attracted world-wide attention.

In the third decade, marine use of the Diesel received a fresh impulse when fishermen discovered its advantages. Among these were savings in their fuel bills, dependability, and a longer cruising range. Operators of workboats, and larger cargo-carrying vessels were likewise beginning to recognize the Diesel's advantages over steam. A few truck and bus operators tried out the "new" engine, which was actually over 30 years old at the time, but whose possibilities were being realized but slowly.

The first Diesel locomotive appeared





in this period—1920 to 1930. It was a switching locomotive, put into service in 1925 by the Central Railroad of New Jersey. A few more "switchers" made their appearance by 1930, but not in sufficient numbers to suggest the remarkable story that was due to be unfolded on America's railroads.

Automotive and Locomotive

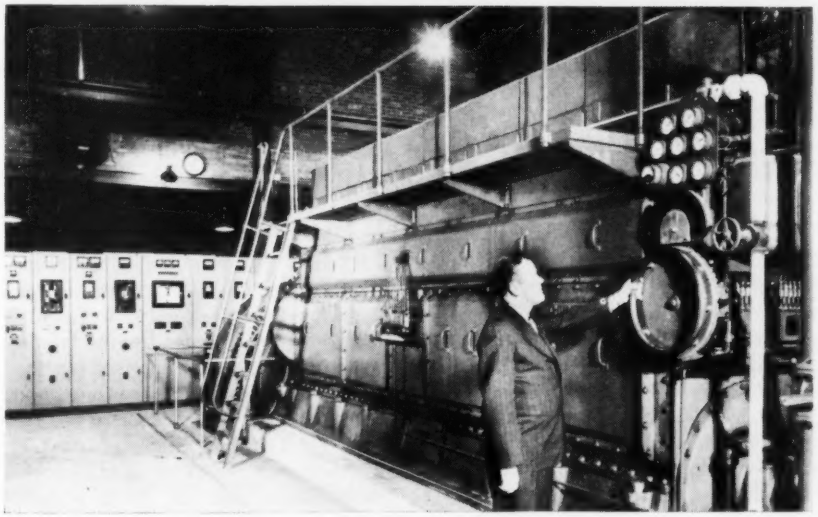
It seems natural, in telling the story of the Diesel, to divide it into decades, and it is really a logical arrangement, for each 10-year period contributed its definite steps.

A new vista in Diesel application, the automotive, opened in 1930. Up to this time the engine had been too heavy for portable, or automotive applications: bus, truck, tractor, and construction machinery such as shovel, hoist, ditcher. The advent of the high-speed Diesel in 1930, which was comparatively light in weight but produced the required power, paved the way for a great new market in automotive applications.

Then, in 1934, came an historic event —the famous "dawn to dusk," non-stop run, from Denver to Chicago, of a streamlined train, pulled by a Diesel locomotive. This dramatized the arrival of a new type of power for main line passenger runs. The first freight locomotive did not make its appearance until seven years later. But by that time everyone knew the "iron horse" was destined eventually to fade from the railroad picture.

World War II

The second World War brought the Diesel industry to the fore as nothing else in its 50-year history had done.



1. The Motorship Sea Witch, a Maritime Commission cargo vessel, is propelled by two 3,000 h.p. normal S.H.P. Nordberg Diesel engines.

2. Exterior view of the Sea Witch.

3. One of two SEH-8 dual fuel engine R.E.A. power plants, Central Kansas Electric Corp., Great Bend, Kansas. Worthington Pump and Machinery Corporation.

The biggest peacetime production the industry had ever known was in its last pre-war year—1939—when $45,525,000 worth of Diesel engine horsepower was produced. Five years later, at the peak of wartime demand, the industry's output aggregated more than a billion dollars' worth—in other words, it was more than a 20-fold increase. The Diesel engine industry at that time was the fastest-growing of any in the country, with the single exception of aircraft.

The Navy called for—and got—Diesel engines to the extent that by 1944 it had more Diesel power afloat (35,000,000 horsepower) than steam. This "all out" production, not only for the Navy, but also for the Maritime Commission and the Army, meant that the manufacturers had to forego filling civilian orders for the duration, but it was a situation that everyone understood and accepted.

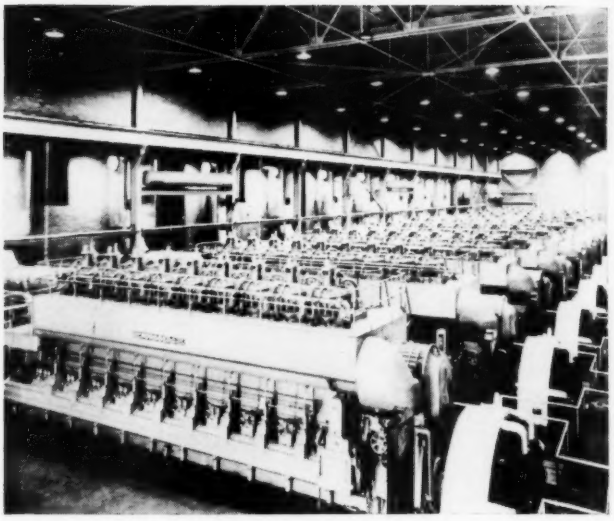
The Picture Today

With the war having ended more than three years ago, it is interesting to take stock of the position of the industry today.

The peak production of 35,000,000 horsepower in 1944 has leveled off to an approximate average of 10,000,000 horsepower per year. We expect to see 100,000,000 horsepower produced in the first decade following the war, or by 1955. This is nearly five times the production pace of 1939—a level to which, of course, the industry will never return.

(Continued on Page 6)

The "Frances M. Hougland," recently completed by the Nashville Bridge Company. The main propulsion units are two JS-DR8-cylinder turbo-supercharged Cooper-Bessemer Diesels, rated at 1,110 horsepower each.



The world's largest Diesel installation. One of two power plants of nine engines each. The eighteen 3600 B.H.P. two-cycle gas burning Nordberg Diesel engines total 64,000 horsepower. Reynolds Metal Co., Jones Mills, Arkansas.

The Story of the Diesel

(*Continued from Page* 5)

A few figures will make this clear. According to conservative estimates, during the next five years the railroads alone will acquire enough Diesel locomotives to add 15,000,000 of Diesel engine horsepower to their total. Light and power plants, shops, mills, waterworks, ice plants, breweries and pipeline pumping stations will require 11,555,000 additional horsepower in the five-year period. Workboats, fishing vessels, tankers and cargo-carriers will take 3,914,000 horsepower more. That totals more than 30,000,000 horsepower exclusive of trucks, buses, tractors, contractors' machinery and miscellaneous industry. Add in the latter uses and you have well over the 50,000,000 horsepower mark for the five-year period.

As of August 1, 1948, 93 per cent of all locomotives on order by United States railroads, were for Diesels. Ninety-six per cent of all locomotives put into service during the first seven months of this year, were Diesels. There are 903 cities and towns in the country which have their own Diesel-operated light and power plants, and the list is growing rapidly.

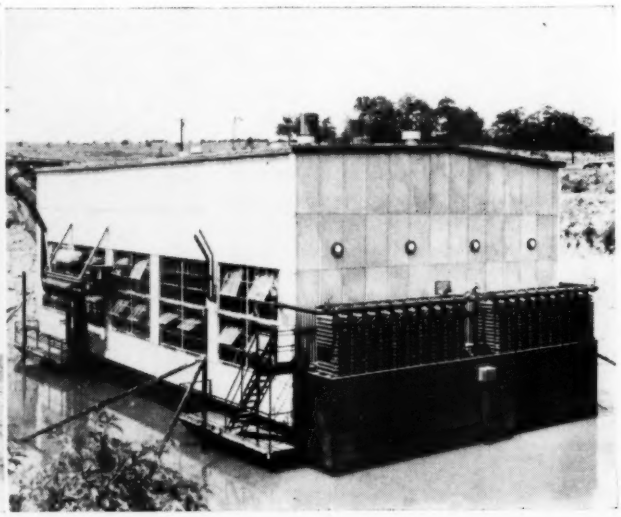
Diesel power is largely used in the oil industry—drilling, pumping, ditch-digging, backfilling, and transportation of product. Heavy sales of petroleum products assure a continuing demand for Diesels in this industry. Overland bus lines are rapidly going Diesel. So are city and inter-city buses, and heavy-duty trucks. Many irrigation projects are Diesel-powered.

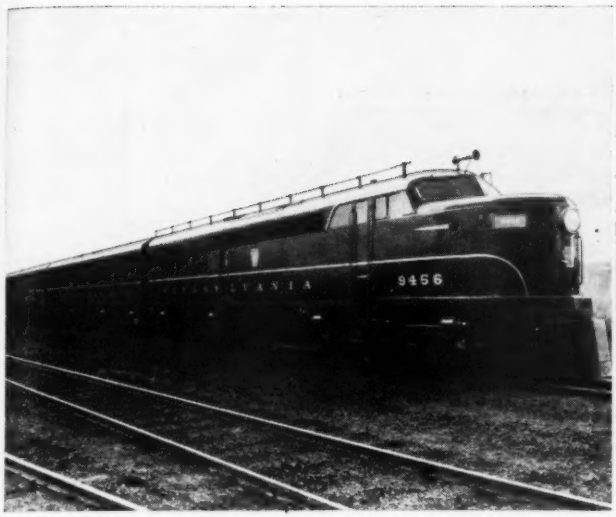
Future Engines and Engineers

Occasionally we are asked, "What is being done toward developing better Diesel engines?" Our complete answer to that would almost fill a book, but I shall try to summarize it in two or three paragraphs.

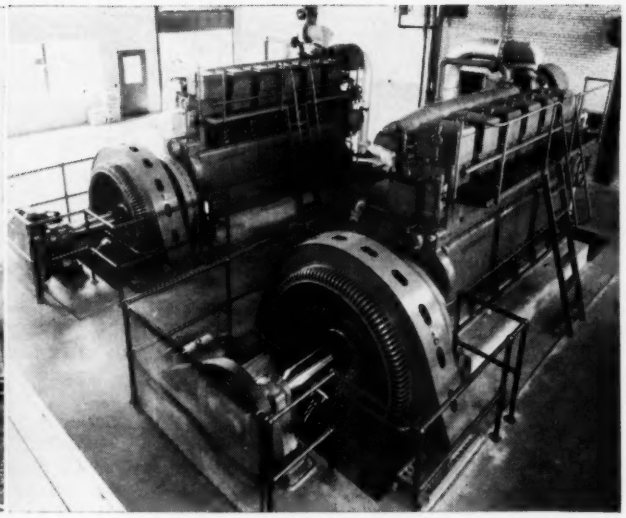
Diesel-powered, 350-ton dragline operated in a coal strip-mine near Grove City. A Cooper-Bessemer GN-6 type Diesel engine gives it from 375 to 420 operating horsepower.

This water pumping station on a barge has the capacity to supply a metropolis of 400,000 people. Coils in the foreground are for cooling Cooper-Bessemer Diesel engines which power the pumping equipment.





Freight road locomotive, 6,000 h.p., for Pennsylvania Railroad, manufactured by Fairbanks-Morse & Co.



Diesel engine installation at Elk River, Minn. Worthington Pump and Machinery Corporation.

It should first be pointed out that this is an engineers' industry. It takes engineers to design, build, test, erect and operate Diesels. Yes, even to sell them. Experiment and research, so necessary to keep perfecting our product, are engineers' projects.

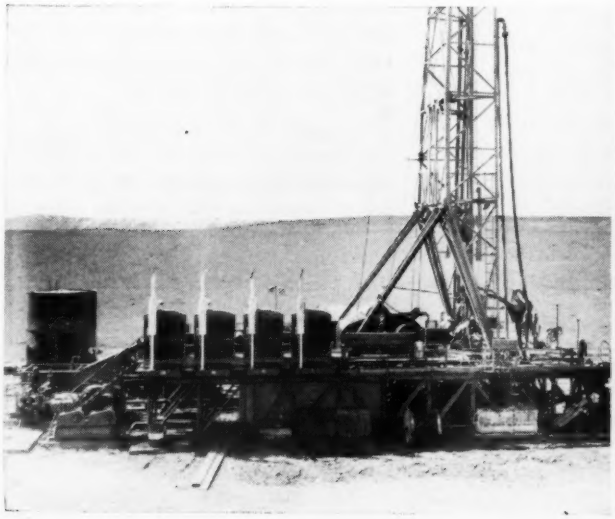
Now, the industry has never had enough good engineers because the colleges and universities have not been equipped to turn them out. There has been a lack of proper laboratory equipment, of good text books, and of professors who know the Diesel industry and its requirements.

To remedy this situation, the Diesel Engine Manufacturers Association called upon its members, and upon the manufacturers of Diesel parts, accessories and oils, to give the schools a hand. They responded, and are now working in close cooperation with the schools in an organized, well planned, five-year educational program.

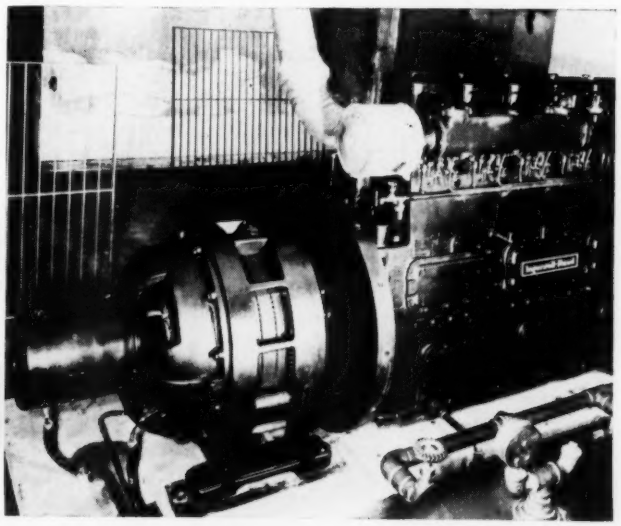
Schools are getting the laboratory equipment they need. Steps are being taken to provide them with suitable text material. Professors are touring plants of Diesel engine builders, parts makers and oil refiners, by Diesel Association invitation. They are seeing first-hand how these products are built. They are receiving for their schools, literature, films, slides, cutaway models, class room lecturers—they are even being offered summer employment for "brush up" purposes.

Out of this will come even better engineers than those who have been graduated in the past from the nation's 112 accredited mechanical engineering schools. It is a cooperative job that is without parallel in the annals of American industry. We do not deny that we have a selfish interest in doing it. We know that with better engineers being graduated from the schools, better engines will be built, and superior performance will be delivered by them. This will react to the advantage of all of us. In helping the schools, and the young men who are studying engineering, we are also helping ourselves.

Ideal type 125 consolidated rig in 136' Ideco Cantilever Mast, 4 Superior PTD-6 Diesel engines; 2 Ideal C-350 power pumps, in the California field. National Supply Company.



Six cylinder "S" engine drawing 260 KW generator. Located in a South American City. Ingersoll-Rand Company.



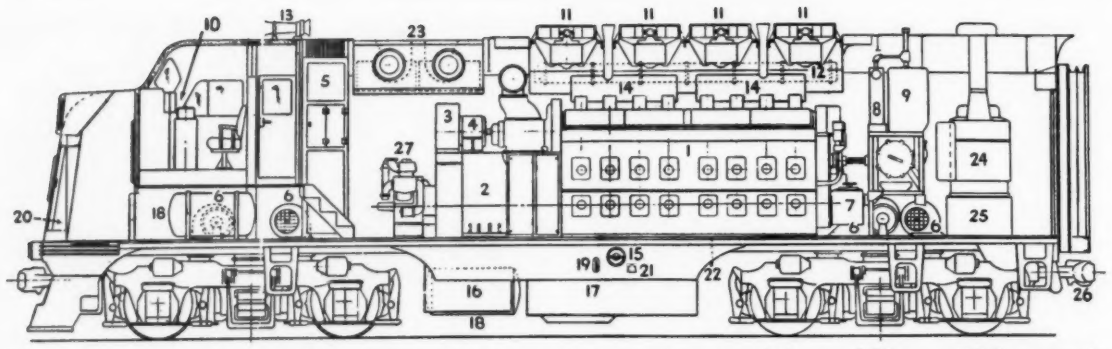


Diagram shows location and arrangement of many units and parts of General Motors F3 Locomotive

1. Engine EMD model 16-567B
2. Main generator and alternator
3. Generator blower
4. Auxiliary generator
5. Control cabinet
6. Traction motor blower
7. Lube oil filter
8. Lube oil cooler
9. Engine water tank
10. Engine control and instruments
11. Fan and motor
12. Radiator
13. Horn
14. Exhaust manifold
15. Fuel filler
16. Batteries
17. Fuel tank—1200 gallons
18. Main air reservoir
19. Fuel tank gauge
20. Door
21. Emergency fuel cut-off
22. Engine water filler
23. Dynamic brake grids and blower
24. Steam generator
25. Steam generator water tank
26. Automatic coupler
27. Air compressor

THE DIESEL LOCOMOTIVE

PREFACE OF A NEW ERA

One widespread misconception needs to be cleared away at the start of any attempt to evaluate the General Motors locomotive. This misconception grows out of the overwhelming emphasis that nearly everyone places upon the prime mover. Due to the fascination which clings to the word, the popular interest lies in the fact that these are *Diesel* locomotives.

This serves to cloud the importance of what has taken place. For, what has happened is this: A forty year old dream of railroad mechanical engineers has been realized.

The machinery for application of the inherent economies and superior performance possibilities of the internal combustion engine to all classes of railroad motive power operation at last has been developed and proven successful.

Perhaps this will become a bit clearer when it is understood that if the gasoline engine or the gas turbine were developed to the point where their advantages equalled or surpassed those of the Diesel engine, either could be dropped into the existing locomotive in place of the Diesel engine. About the only change necessary would be the addition of some gearing to compensate for the higher operating speeds of gasoline engines and gas turbines. Diesel is used at present because of its superiority over the gasoline engine and the gas turbine in thermal efficiency, dependability and other vital categories.

We are prone to overlook the importance of *applying* the power at the rails. This, in the case of the internal combustion locomotive, happens to be as much of a problem as development of a successful prime mover. Actually, in the General Motors locomotive, the Diesel engine represents roughly one-fifth of the design, material, and labor in the total locomotive. It might be said that it takes four-fifths of the locomotive to make the power of the Diesel engine available at the rails where it can do useful work.

An Evolving Process

A great many persons have the idea that the Diesel locomotive is something that suddenly happened in 1934 when the first Diesel powered streamlined train went on the rails. The truth is that the Diesel locomotive evolved out of the gasoline rail car and its earliest roots trace back to a desire of engineers, both on and off the railroads, to apply the advantages of the internal combustion engine to main line railroad service. This idea had persisted ever since the gasoline engine's first successful mobile installation in the automobile.

Lack of two items delayed realization of the dream. One of these items was an engine powerful enough to pull regular trains, yet small and light enough to fit the confines and strength of a standard railroad car. The other was lack of a transmission system strong enough to take the tremendous strains of starting the heavy weights of a train, flexible enough to provide application of this necessary power throughout the speed range, and of sufficiently small bulk to fit into the space limits of the power car.

If we regard the over-all problem as that of applying the advantages of the internal combustion engine to main line railroad operation we can show that three powerful streams of thought and action finally flowed together in the Pioneer Zephyr of the Burlington Railroad in 1934 and there, at last was the solution.

They came from: (1) Progressive railroad men, (2) Rail car activities of Electro-Motive Company, and (3) Development of the two-cycle Diesel engine under Charles F. Kettering.

As early as 1905 the McKeen Company, and the next year, General Electric, came out with gasoline rail cars, and between that date and the outbreak of World War I the two companies had put over 250 cars into branch line service. Both companies abandoned the experiment early in World War I, because of a lack of suitable engines, and difficulties in transmissions. The dream persisted among railroad men, and among outside engineers, but the shocks of starting and stopping with no rubber tires to serve as cushions destroyed mechanical transmissions at a prohibi-

tive rate. A number of motor truck manufacturers tried, with no success, to put flanged wheel trucks and busses on the rails.

Mr. H. L. Hamilton, now a Vice President of General Motors, and founder of Electro-Motive Company had been intrigued throughout his early railroad service by the possibilities of the internal combustion engine, and during World War I, he was presented with a proposal that his company supply their most powerful truck with flanged wheels, to solve a difficult munitions supply problem. Mr. Hamilton supervised the experiment, the idea received publicity, and as a result quite a number of flanged wheel busses were put on branch lines by Mr. Hamilton's company and others. While they were abandoned after a few years, they did serve the purpose of persuading Mr. Hamilton to develop a rail car that would take its place with steam locomotives.

Electro-Motive Formed

He left the motor truck business in 1922 and, with a small staff, designed and farmed out for construction two cars. The Chicago and Great Western Railroad purchased one and the Northern Pacific the other. They worked well.

Orders began to come in. Electro-Motive Company was on its way, and between 1923 and 1930 it put more than 500 cars on the rails, practically all of which still are operating on branch lines in this country. The basic principles of the electric transmission, power plant and car construction with other fundamentals vital in the design of today's streamlined trains and Diesel locomotives were largely developed in the design and production of these 500 railmotor cars, not the least of which was the bridge type of construction which would enable the locomotive cars to successfully absorb the high strains of starting the heavy weight of trains attached to the car body.

So, two of our streams of action were forging forward by 1930, one, the railroad desire to have internal combustion powered trains out on the main lines, and the other, Electro-Motive with its wealth of experience in the design of power cars, the electric transmission and such engines as had been available up to that time.

The juncture with the third stream began to occur in 1930 when General Motors acquired both the Electro-Motive Company and the Winton Engine Company. Winton had been building gasoline and distillate engines from designs by Electro-Motive for Electro-Motive rail cars for several years.

Back in 1928 Mr. Kettering had started the General Motors Research Laboratory study of Diesel engines. In this study he had bought two Winton Diesels. He discovered that Winton engineers had ideas that ran along with those of himself and staff. By natural evolution, Winton, Electro-Motive, Mr. Kettering and his staff gravitated into one group under Kettering's direction and the development of the smaller, lighter Diesel engine was tremendously accelerated. In 1933 the first two of the new GM two-cycle Diesel engines appeared, manufactured by Winton. They were placed in the GM Building at the Chicago Century of Progress Exposition. The Kettering-Winton combination had cut the weight of the Diesel engine to one-fifth its previous figure and put the power in a package one-fourth the former size. Here at last was 600 Diesel horsepower in an engine more than small and light enough to fit inside an even sub-standard dimension railroad car.

The Burlington and Union Pacific trains were such successes that other railroads were immediately interested, especially the Santa Fe and the Baltimore and Ohio, which asked for separate Diesel locomotives that could pull any kind of passenger train and that would not have to be permanently tied into the same set of streamlined cars.

Mr. Hamilton and his staff went to work on the separate Diesel locomotive and brought out the first demonstration model in 1935. It was a two-car 3600 horsepower locomotive. The Santa Fe ordered one and established the 39¾ hour Super Chief service with this locomotive, between Chicago and Los Angeles, cutting the time from the previous schedule of 56 hours. The Union Pacific, Chicago and Northwestern, and Southern Pacific came shortly thereafter with the GM Diesel locomotives at the head of the "City of Los Angeles," "City of Portland," and "City of San Francisco" in similar service to those three cities from Chicago.

In 1935 Electro-Motive broadened its developing line with a 600 horsepower switching locomotive and 1000 horsepower switching locomotive. A large plant was built at La Grange for the complete fabrication of Diesel locomotives and Electro-Motive attained divisional status in General Motors although operating as Electro-Motive Corporation. The name was changed to Electro-Motive Division of General Motors, January 1, 1942. Engine manufacture for locomotives was switched from the Cleveland plant of the then Winton Engine Division to the new plant of Electro-Motive in 1938. Electro-Motive by 1938 began to make its own traction motors, generators and control apparatus. An engine improvement brought the passenger units up to 2000 horsepower per unit. Late in 1939 Electro-Motive sent its first 5400 horsepower Diesel freight locomotive out on a demonstration tour which took it 83,000 miles over 20 Class I railroads in eleven months. They began to go into service in January, 1941.

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140 S. DEARBORN STREET

CHICAGO, ILLINOIS

EUGENE MITTELMANN
E. E., Ph. D.

Consulting Engineer & Physicist

High Frequency Heating—Industrial Electronics

Applied Physics and Mathematics

549 W. Washington Blvd. Chicago 6, Ill.

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PREFACE OF A NEW ERA

(*Continued from Page* 9)

The line now includes a 2000 horsepower high speed passenger unit (which may be combined with other units to produce 4000, or 6000 horsepower), a 1500 horsepower freight and/or heavy duty passenger unit (which may be combined to provide 3000, 4500 or 6000 horsepower), 1500 horsepower branch line all-purpose locomotives, and three switching locomotives of 600, 1000, and 2000 horsepower.

Electro-Motive had established another important advance in locomotive manufacture. For the first time standard locomotives were being made and sold to the railroads. From the inception of railroading steam locomotives had been made to special design for each lot ordered. Electro-Motive now demonstrated that it was possible to design standard locomotives for the various services with sufficient flexibility to fit the variations in climate, track, and operating requirements from coast to coast. Many economies and improvements in service have grown out of this standardization.

Electro-Motive has grown to the position of the world's largest manufacturer of locomotives, currently employing 13,000 persons, 10,000 of whom are at the main plant in LaGrange. Two other plants are located in Chicago and in Cleveland, Ohio, and four repair shops are located in widely separated parts of the country. Over 250 Chicago area manufacturing concerns contribute parts or materials. The company turns out six completed Diesel locomotive units from the LaGrange plant every working day. (A unit is a car in the case of a main line locomotive or the complete locomotive in the case of a branch line or switching locomotive).

More than 4,600 units of General Motors Diesel locomotives (all products of Electro-Motive bear the GM name) are in service on United States, Mexican and Canadian railroads. Approximately 10 per cent of the nation's railroad freight tonnage, and more than 20 per cent of the nation's passenger train car miles is handled by GM locomotives.

These locomotives are now operating on 103 railroads on the North American continent and Electro-Motive has just taken the first step in invasion of the overseas market by completion of an arrangement whereby the Clyde Engineering Company of Granville, Australia, is licensed to build General Motors Diesel locomotives for the Australasian territory using to a large extent components manufactured in Chicago Electro-Motive plants.

Through ten years of service, certain operating advantages of Diesel became apparent to railroad management. They include:

1. Faster scheduled operation.
2. As much as 50 per cent decrease in operating costs.
3. As much as 50 per cent decrease in maintenance costs.
4. Higher availability.
5. Freedom from costly supporting services such as ash dumping and removal, water treatment and storage, boiler washing, and the like.
6. Less wear on track due to elimination of hammer blow inherent in steam locomotives.
7. Important contraction of backshopping facilities due to far longer periods between major overhaul and the fact that the Diesel locomotive is a collection of small, standardized, prefitted parts.
8. Uniform operation in all variations of weather, climate, and terrain.

The faster schedules which Diesels maintain, both in freight and passenger service, accrue from the following: Faster acceleration, higher speed up grades (and down grades in the case of the freight locomotive with electric retarding brakes), ability to take curves faster than steam locomotives due to the Diesel's low center of gravity, minimum of service stops, and elimination of locomotive changes. The Diesel advantage of ten hours under the fastest steam schedules between Chicago and the Pacific Coast is largely due to time saved by the above advantages, and not to excessive bursts of speed.

From the standpoint of the public, the Diesel advantages that become apparent in the first ten years of service are:

1. Faster, safer scheduled operation.
2. More reliable operation.
3. More comfortable ride.
4. Cleaner ride.
5. Possibility of lower costs.

The passenger future of Diesel is interesting. Undoubtedly the economies of Diesel will continue to force its adoption, not only for the fast trains and for the lifting of the service level of slower trains, but also for the utility passenger trains that hitherto have seriously cut into railroad operating statements. It is very likely that many branch lines will be saved for outlying communities by the application of a suit-

General Motors 6000 horsepower model F3 locomotive, used on Santa Fe Chief and other famous name trains of this railroad.

able type of locomotive. This locomotive can travel sixty to seventy miles an hour with a short freight or passenger train and do its own switching very effectively at the end of the line. A typical application of this kind would be two such Diesels which replace five steam locomotives on a losing branch. Each of the two Diesels hauls a passenger train one way over the branch in the daytime and brings back a freight train at night, each locomotive doing all the switching necessary as it goes along and at the terminals. The railroad would be enabled to abolish watering facilities along the right-of-way, tear down a tax-eating round house at both terminals, and get rid of ash dumping and removal facilities. The losing branch probably could be turned to at least a break-even basis and the service saved for the remote communities that had no other major means of transportation.

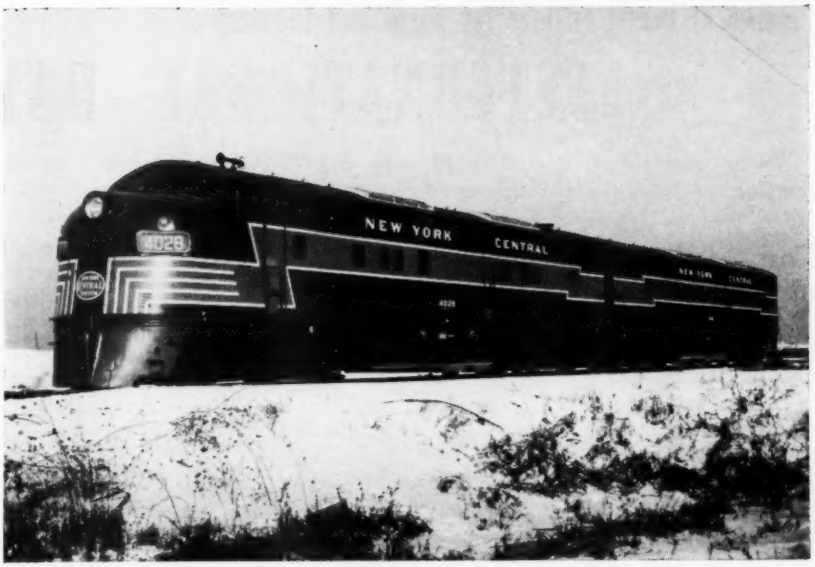
But the most interesting outlook on passenger application is in the evident intent of the railroads to go in for fast, modern coach trains, as was indicated in a survey of "Railway Age." These day coach trains immediately pre-war were among the most profitable trains operated by the railroad.

The internal combustion engine at last is on the rails. Hundreds of passenger and freight trains before and during the war have traced the pattern of the new era in American transportation, an era in which the public will be served with speed, comfort, safety and economy in the mass movement of men and goods beyond the dreams registered in pre-war blue prints. Mass application of the new tool is in progress on many railroads. The new era is well launched. The exciting privilege of seeing it come to full fruition faces present generations.

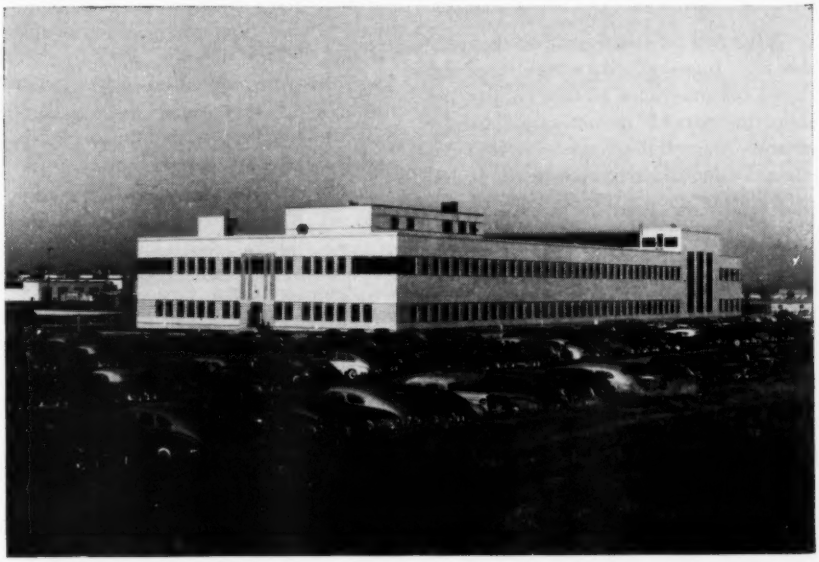
Personal

Mr. Byron H. Cutler, member W.S.E., has recently acquired financial interest in the Muncie Construction Corporation, Muncie, Indiana, and is now its Vice President and General Manager. This company engages in electrical construction for public utilities.

Mr. Cutler was Electrical Engineer and Chief Engineer of The L. E. Myers Co., Chicago, Illinois. Previously he worked as Design Engineer for Public Service Company of Northern Illinois and for Commonwealth and Southern Corporation on transmission line construction.



Motive power for the Twentieth Century Limited and other famous name trains of the New York Central—General Motors locomotive built by Electro-Motive Division.



The Locomotive Development Center, dedicated Oct. 24, 1947 as a highlight of Electro-Motive's 25th Anniversary celebration. The two-story building, 389 by 147 feet, is located east of the Administration Building at the Electro-Motive Plant.

MIDWEST ENGINEER regrets that the credit line for the October issue article, "If An Atomic Bomb Hit City 'X,'" was omitted. The article and illustration were reprinted from the Bulletin of the Atomic Scientists.

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Plants at: CHICAGO, BIRMINGHAM,
SALT LAKE CITY, GREENVILLE, PA.

Pioneer of Diesel Engines for Farm and Industry

INTERNATIONAL HARVESTER

Among those who pioneered the development of the modern high speed Diesel engine, International Harvester engineers played a leading role. They sought to provide the advantages of Diesel power in engines comparable in size, simplicity and ease of operation and service to the widely-understood gasoline engine.

Many years of research and experimentation were spent by these engineers in developing engines for farm and industrial use capable of using heavier, less expensive fuel than gasoline. As early as 1909, International Harvester demonstrated the practicability of such heavy-fuel engines by using kerosene-burning engines to drive farm tractors.

As the still greater operating economy and the "lugging" characteristic of the Diesel became more widely known, the company turned its attention to the potentialities of Diesel power. Its engineers conducted early investigations and experiments on the adaptation of compression ignition engines to farm and industrial equipment. The most successful European engines were imported and tested, and the data used as a basis for further experimentation and improvements.

Out of this background came the modern International Harvester Diesel engine, incorporating the best design features perfected through the program. One of the most important from the standpoint of savings in job time, fuel and maintenance costs, as well as of customer convenience and acceptance, is International Harvester's exclusive gasoline/Diesel conversion starting system. This permits the engine to be started and warmed-up as a low-compression gasoline engine before it is operated as a full Diesel.

Fuel System Unique

As with all Diesels, the fuel system is the heart of the International engine. This, too, is of the company's own design. It is relatively low in cost and easy to service or replace. In addition to precisely measuring the fuel charges and delivering them to the cylinders, the system provides, through fuel injection pump-governor combination, exact control of engine speed. It also increases the fuel charge to raise torque when overload pulls down the r.p.m.

Design of the precombustion chamber reflects the results of extensive research. International Harvester engineers experimented for many years with the precombustion chamber type of Diesel, in order to exploit fully its inherent characteristics of smoother operation and less critical reaction to variations in fuel quality.

Following the earlier work on Otto cycle engines for low-cost fuel operation, International Harvester launched a program of research on Diesel engines in 1916. By 1919, a single-cylinder horizontal type Diesel of the precombustion chamber type was successfully developed. This engine, operating on fuel oils regularly used in heat-treat furnaces of that time, developed 10 brake horsepower with 80 lbs./sq. in. brake mean effective pressure.

Diesel engine performance of the time, however, was not as promising as that of the carbureted type kerosene-burning engines already used on tractors.

But these kerosene-burning engines were comparatively low in thermal efficiency, and their torque at slow speed was not much more satisfactory than gasoline engines of that date. The search for better thermal efficiency and increased torque in heavy fuel engines swung the emphasis of the International Harvester development program back to the Diesel.

International Harvester engineers had been in Europe, studying the performance of the best engines there. As a result, a German Dorner engine was imported in 1927, for tests in the company laboratory.

Thorough tests produced results promising enough to warrant the application of Dorner principles to a Diesel of International Harvester design. A four-cylinder, 4-1/4′ x 6′ Diesel was completed in September, 1928.

In spite of the fact that it was quite efficient, this engine was discontinued because of combustion noise, smoke and sensitivity to variations in the fuels then available. With some of the present-day premium fuels, the engine might have shown greater possibilities.

An experimental single-cylinder, precombustion engine of International Harvester design, completed early in 1930, was used to test many different combustion chamber designs and injection system combinations. Results showed the precombustion-chamber type engine to be superior to the open chamber engine as regards smoothness of operation and lower sensitivity to variations in fuel quality. Maximum combustion pressure was found to be considerably lower for the precombustion type. Since 1930, International Harvester design has been directed toward exploitation of these desirable characteristics of the precombustion chamber engine.

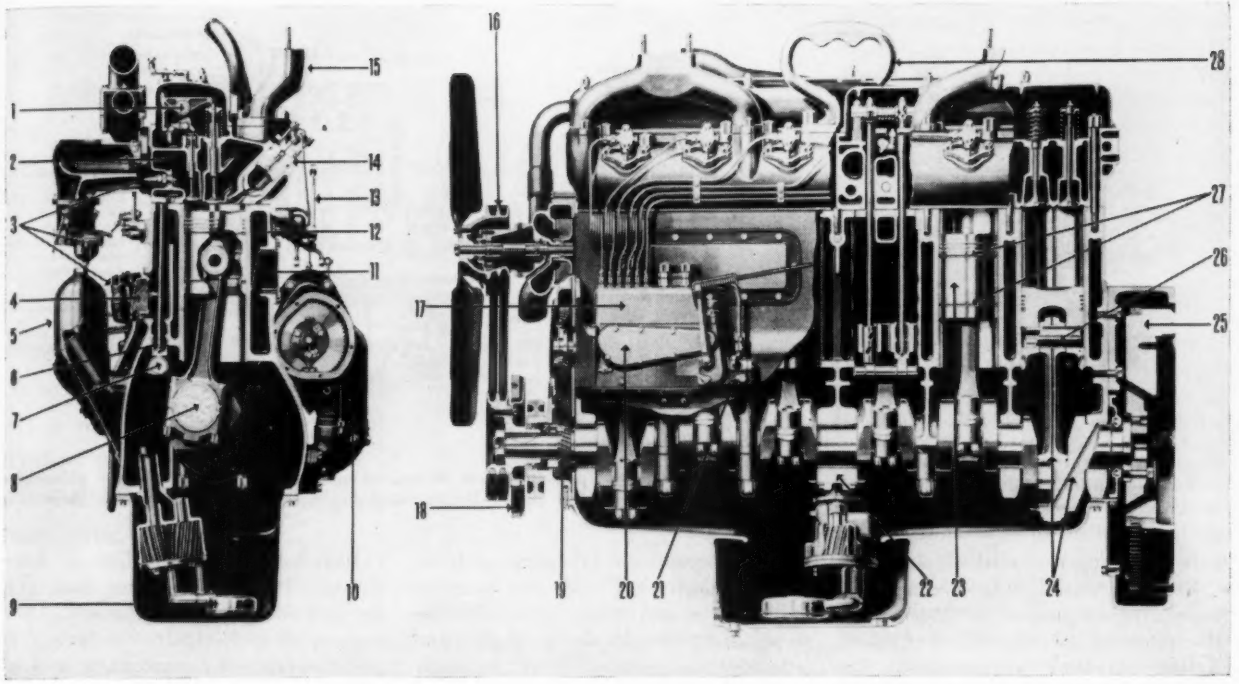
Starting System

Starting was recognized as one of the basic problems that might hamper the progress of the Diesel engine. High compression ratios made it impractical to start the compression ignition engine by cranking. International Harvester gave this hard starting characteristic intensive study during 1928-30 and developed its exclusive gasoline/Diesel conversion starting system. An outstanding success from the first, this system is standard in every International Diesel engine.

The International starting system comprises an auxiliary combustion chamber, connected to the main combustion chamber by a passage which is closed or opened by a poppet type starting valve; a spark plug, to which ignition current is supplied by a small magneto; and a simple jet gasoline carburetor installed in the air intake manifold. A change-over lever and linkage mechanism activate the starting system, and cuts it off when the engine is switched to full Diesel operation.

Development of a smaller, cheaper fuel injection pump capable of delivering exactly controlled amounts of fuel to the cylinders, and of operating at high speeds, was another important object of the firm's program. As early as 1929, a unit-type four-cylinder pump, complete with governor, of International Harvester design had been developed and tested.

Further refinements in design resulted in a four-plunger International Har-



Sectional view of the International UD-24 Diesel engine. Identification of construction features:

1. Pressure-lubricated rocker arm shaft.
2. Auxiliary combustion chamber for gasoline starting, reduces compression from 15:1 to 6½:1. Used only in starting.
3. Spark plugs, carburetor and distributor, used only in starting.
4. Filter-protected crankcase breather.
5. Replaceable lubricating oil filter.
6. Hardened valve lifters.
7. Pressure-lubricated camshaft.
8. Induction-hardened, precision-bearing crankshaft.
9. Floating oil intake screen.
10. Efficient fuel filter with replaceable element.
11. Cooling water baffle.
12. Full-length water jacket.
13. Changeover lever for gasoline conversion starting.
14. Advanced design fuel injection; single-orifice injection nozzle and precombustion chamber.
15. Straight line exhaust scavenging.
16. Double V-belt fan and water pump drive.
17. International twin-plunger fuel injection pump.
18. Crankshaft vibration damper.
19. Helical timing gears.
20. Variable speed governor.
21. Accessible primary fuel pump.
22. Large, center main bearing takes up end thrust.
23. Durable aluminum alloy piston.
24. Rifle-drilled lubricant passages.
25. Heavy flywheel.
26. Full-floating piston pins.
27. Two oil-control piston rings.
28. Engine lifting hook.

vester fuel injection pump with integral governor and torque control, which was used on all four-cylinder International Diesel engines prior to 1940. Continuing work on injection pumps was directed toward perfection of a single-plunger model which would be lower in cost, provide superior uniformity in metering and deliver fuel at high speeds.

Experimentation on the single-plunger type was begun in 1934. Today, the company manufactures a single-plunger pump for four-cylinder engines and a twin-plunger pump for six-cylinder models. Both are of International Harvester design and have inbuilt governor and torque control device.

Harvester engineers perfected a fuel injection nozzle ideally suited to their requirements comparatively early in the development program. It is a simple, rugged, easily serviced assembly — a low-opening pressure, poppet-valve type, single-orifice nozzle. Opening pressure is 700 p.s.i. and orifice diameter ranges from .032″ to .042″, depending on engine size.

Cheap to make, easy to maintain and reliable in service, this nozzle assembly and orifice plate design has proved so successful that it has been used in original production form in all International Diesels.

Start Production

As a result of these and other research accomplishments, International Harvester was ready to go into production on the first of its line of International Diesels at the end of 1932. A four-cylinder, 4¾′ x 6½′, precombustion chamber type full Diesel had been developed to the point of acceptable performance on the Diesel fuels then available.

This Model PD-40 started as readily as the conventional gasoline engine, warmed up faster than the Otto cycle heavy fuel engine, and had thermal efficiency and low speed torque superior to the gasoline engine. It was of overhead valve type, using a modified Deutz precombustion chamber. Compression ratio was 14:1, but operating full load combustion pressure did not exceed 750 p.s.i. at speeds from 1000 to 1350 r.p.m.

In the three years following the start of production on the PD-40 in April, 1933, the engine was continued in its original form, while the research program was carried forward at an accelerated pace. Foreign-made Diesels were brought to the laboratory and thoroughly tested. Although the tests added to the company's store of knowledge, they produced no results warranting any change in the basic combustion system of the International Diesel.

A six-cylinder, 4¾′ x 6½′ engine developed during this period, was released for production in February, 1936. Although founded on the same basic principles as the PD-40, this Model PD-80 incorporated modifications in the location and form of the precombustion chamber, providing better combustion and more effective circulation of water around the valves.

Similar changes were made in the PD-40 at this time. Later in 1936, a smaller engine, Model 35, was put in production. This was a four-cylinder full Diesel, differing from the PD-40

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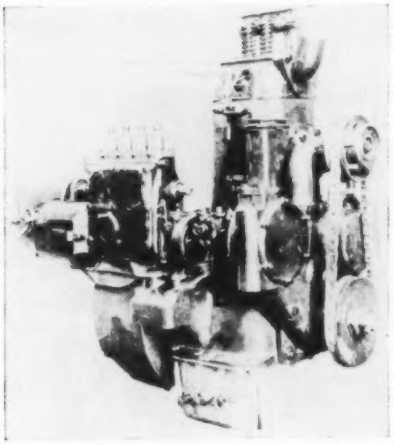
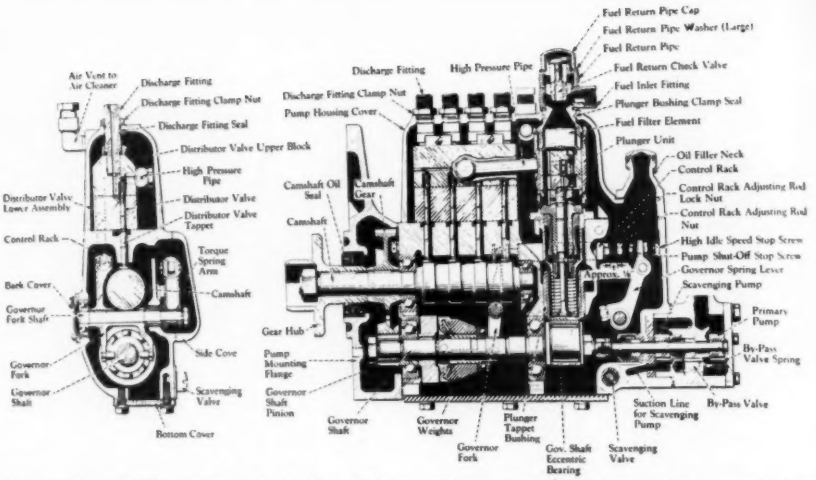


Experimental International Diesel Engine —Single-cylinder, 4-¾ x 6-½ model built in 1930 at the International Harvester research laboratory.



International Diesel Fuel Injection Pump—Cross sectional view of the assembled single-plunger pump for four-cylinder engines, with component parts identified.

only in having a smaller displacement.

Research and development activities were greatly expanded by International Harvester in the period of 1936-40. Among improved instrumentation was a high speed camera which made it possible to record and study the phenomena of fuel injection and combustion in the Diesel engine. Out of such studies, made on many types of chambers and with various nozzles and fuel pumps, came the data from which the company designed a complete new line of engines.

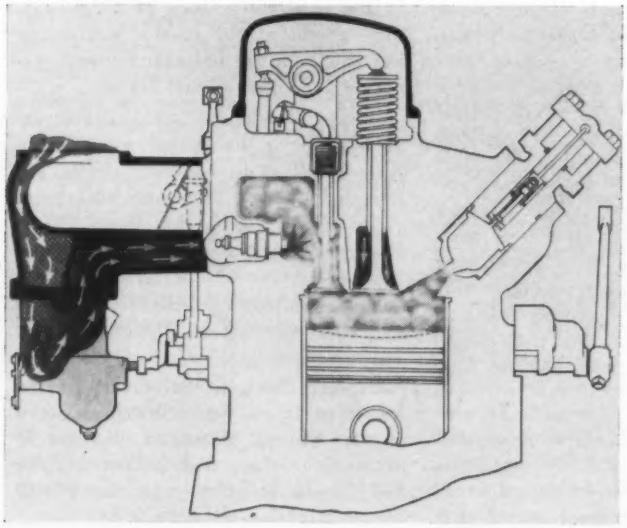
The International injection nozzle remained unchanged and the company adhered to the basic precombustion type. However, the design of the precombustion chamber was radically changed. With the new precombustion chamber it was possible to reduce maximum combustion pressure and maximum rate of pressure rise without change in compression ratio. The excess air factor was also reduced, with resulting increase in b.m.e.p., improved combustion control on variable speed and load operation, and increased speed.

Included in the new line of International Diesels were three four-cylinder and one six-cylinder models. These engines proved highly satisfactory in performance and dependability, and are still in production with only minor changes in the original specifications.

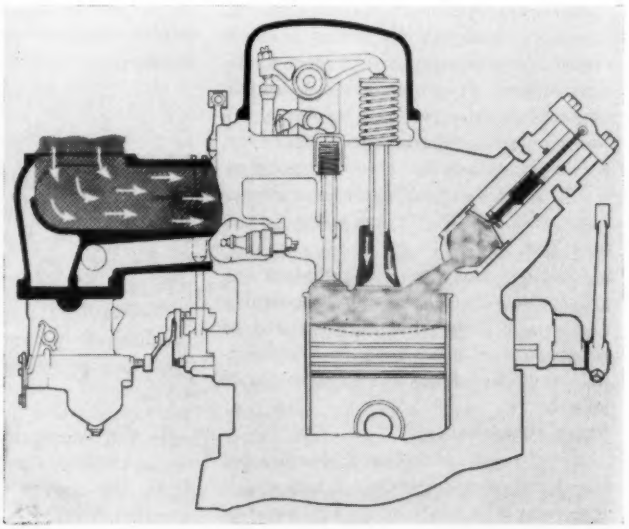
No changes in design were found necessary to meet the exacting demands of war service. Flexibility of the design is illustrated by the fact that the post-war requirements for increased specific power output were met in these engines without change of engine size.

(*Continued on Page* 19)

The International Gasoline/Diesel Conversion Starting System —Gasoline conversion for starting—Air from the intake manifold, shunted through the carburetor, mixes with the gasoline and enters the combustion chamber through the intake valve. With the starting valve open, the auxiliary and main combustion chambers comprise a single chamber, the volume of which brings the compression ratio down to 6-½ to 1. The explosive mixture is ignited by the spark plug.



The International Gasoline/Diesel Conversion Starting System —Normal full Diesel operation—With the change-over lever in position for the Diesel cycle, the poppet type starting valve is closed, sealing off the auxiliary combustion chamber and restoring the high compression ratio of 15:1. Diesel fuel is injected directly into the precombustion chamber, where ignition begins. Combustion spreads into the main chamber where the fuel charge is completely burned.



Gas Turbines on Wheels

. . . will find economical application as compared to Diesels . . .

W. A. Giger
Turbo-Power Development Dept.
Allis-Chalmers Manufacturing Company
Milwaukee, Wisconsin

The thought of using turbo-type machines as prime movers for the propulsion of railway trains is a fascinating one. Soon after the establishment of the steam turbine in the power field, engineers investigated the possibility of its introduction into railway service. Surely this high speed machine with purely rotating motion would be ideal when compared with the reciprocating steam engines then in general use.

Many attempts were undertaken, with the advent of the steam turbine, to materially improve the low efficiency of the reciprocating steam locomotive. It was apparent that the greatest gain could be realized if condensing operation would prove to be practical. However, it was soon found that the installation of a satisfactory size condenser was impossible due to the large quantities of water that had to be carried along if a water cooled condenser was used. The water, of course, had to be cooled with air which in turn would require large water coolers. If air only were used for the condenser cooling medium, then a huge condensing plant is needed, for which there is no room on a locomotive. Several reciprocating steam locomotives abroad have been equipped with condensers. In most cases, the prime incentive was not increased efficiency but to save on boiler feed water for operation through waterless desert sections of a country, and in no case was the output of the locomotive very much over 1000 horsepower. Several such locomotives are believed to be operating in Sweden, Russia and a few in Argentina. For modern American steam locomotives with their ratings of from 4000-7000 HP it is practically impossible to create a condenser of sufficient capacity because of dimensional limitations with the result that condensing reciprocating type steam locomotives are not used in U.S.A. The same remarks about the necessity of a steam condenser to obtain a satisfactory efficiency apply even more to the steam turbine locomotive. Several condensing steam turbine locomotives have been built by Ljungstrom in Sweden, Krupp and Maffei in Germany, Zoelly in Switzerland and the most recent one by the General Electric Company (with electric transmission) in this country. Non-condensing steam turbine locomotives are operating: one on the former London-Midland and Scottish Railway (now British Railways) in England, one built by Baldwin-Westinghouse for the Pennsylvania Railroad, and one built by Baldwin-Westinghouse for the Chesapeake and Ohio Railroad; the latter one being equipped with electric power transmission.

The above indicates clearly that the steam turbine locomotive has appeared only very sporadically. Lately, the efforts to create an efficient and satisfactory steam turbine locomotive have, in this country at least, been overshadowed by the meteoric rise of the Diesel electric locomotive.

Now, a much talked about prime mover of recent years enters the power field; namely, the gas turbine. During World War II a considerable number of gas turbine compressor units were used in jet propelled aircraft and their number is now increasing rapidly. Furthermore, a very large number of exhaust gas turbines have been employed for many years in combination with blowers for the supercharging of Diesel and aircraft gasoline engines.

So far as large gas turbine compressor units are concerned, the Allis-Chalmers Mfg. Co. has (up to now) furnished over thirty such units for the houdry process in oil refineries, the total rating of their turbines amounting to approximately 182,000 HP. A large number of these units are furnishing 40,000 cfm of compressed air; the gas turbine thereby developing approximately 6200 HP. while a larger unit delivers 60,000 cfm of air, and its turbine produces 10,000 useful horsepower.

The improvements in compressor blading and the introduction of high efficiency reaction blading in the turbine advanced the utility of these turbo-type machines further. Several gas turbine units have been built during the last few years, or are under construction, that are used for the generation of electric power. One such unit has been built into a locomotive that has been in commercial operation abroad for several years. A number of gas turbine locomotives are now under construction in this country and abroad.

The prospects of the gas turbine as a prime mover for railway vehicles are excellent. It is a machine having purely rotary motion and it consists of comparatively few kinds of parts when compared with other railway prime movers, and in its simplest form it needs no water at all. This is a great simplification and it is a great asset for locomotive operation. Gas turbines are now in operation working satisfactorily with a wide range of fuel oils which should result in economical operation for such units. This opens up a big field for oil burning gas turbine locomotives in territories where coal is scarce and expensive, but where oil is readily available and is today burned also in steam locomotives.

The most important and extensive applications of gas turbines for railway and other uses will be achieved by the use of coal as fuel.

The rather limited resources of liquid fuels have greatly stimulated active research on the burning of coal. The Locomotive Development Committee of Bituminous Coal Research, Inc. is now carrying out thorough tests of coal burning apparatus for gas turbine equip-

(*Continued on Page* 16)

(*Continued from Page* 15)

ment. Sometime ago this organization ordered two gas turbine generator plants for coal burning locomotives; one of 4100 HP rating from the Allis-Chalmers Mfg. Co., and another one for similar duty from the Elliott Co.

Fig. 1 shows a cross section of the Allis-Chalmers gas turbine power unit now under construction.

Due to the absence of accelerating forces of reciprocating parts, the gas turbine is a very smooth running machine and is, therefore, well suited for railway work. Its waterless operation is appreciated in summer as well as in wintertime. Train resistance increases in severe winter weather. The better efficiency and the possibility of developing higher turbine output at low ambient temperatures permit the traction power rating to be maintained or even increased under such severe weather conditions.

Many projects have been worked out lately with gas turbine power plants that are available today. Fig. 2 for instance shows an oil burning 3000 HP gas turbine locomotive for high speed intercity trains. The roof line of this locomotive, which weighs about 270,000 lbs. is only 11 feet and its center of gravity only four feet, above the rails, thereby permitting high speeds that should be possible up to 150 mph with safety. Another gas turbine locomotive that offers interesting possibilities is the proposed design as shown in Fig. 3, representing a quite powerful 4100 HP locomotive for heavy traction purposes. Characteristic of this locomotive is the driving mechanism of the two main trucks. All driving axles of one truck are coupled together and it is proposed to drive them by one motor mounted rigidly on the same truck frame. Gear boxes and individual axle drives will be employed to transmit the power from the motor shaft to the axles, thereby decreasing the dead weight of each axle to a minimum. Slipping of axles will be greatly reduced and load-shifting on the axles during starting does not lower its tractive effort. Only one traction motor, easily inspected and maintained, is mounted on each truck. This locomotive, designed for 100 mph maximum speed, is estimated to weigh about 560,000 lbs. (with all tanks full). The gas turbine plants of the locomotives shown in Figs. 1 and 2 are equipped with regenerators. With 70 F ambient, and 1300 F gas temperature they should reach a thermal efficiency of about 24 per cent measured at the generator shafts or about 19.5-20 per cent at the driving wheels.

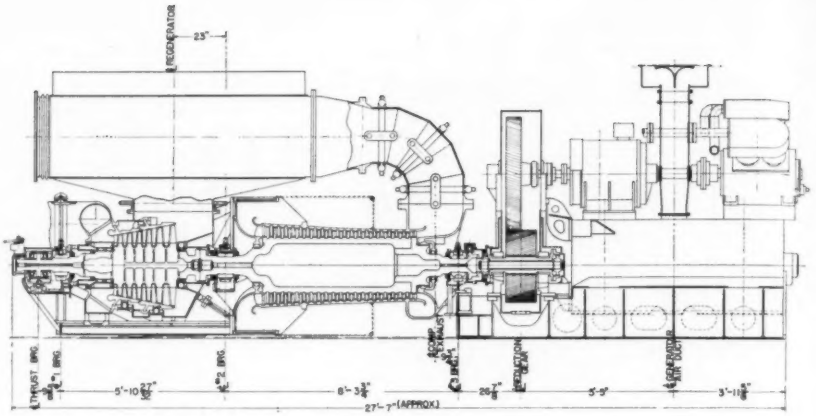


Fig. 1. Cross section of 4100 h.p. Locomotive Gas Turbine unit.

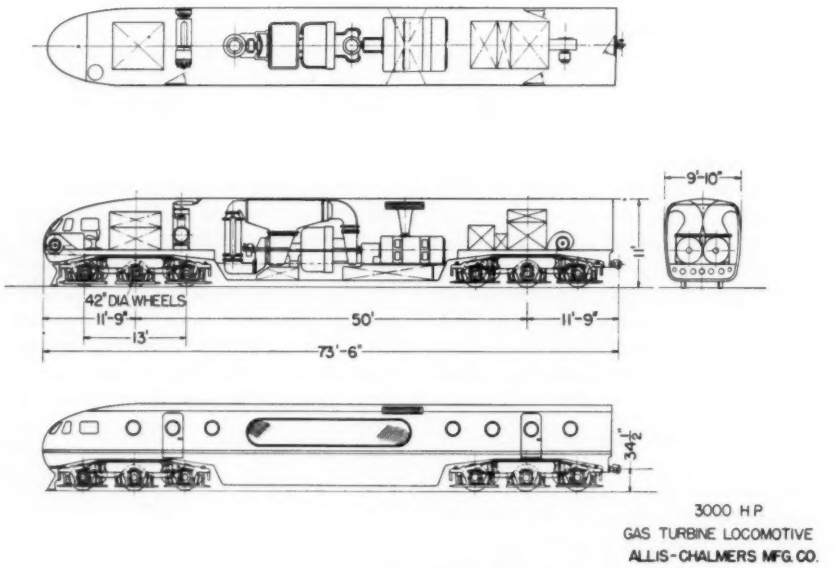


Fig. 2. Gas turbine locomotive, 3,000 h.p., Allis-Chalmers Manufacturing Company.

If properly operated, the maintenance costs of gas turbine locomotives should compare favorably with similar apparatus in stationary power plants.

A comparison of the efficiencies and fuel costs for steam, Diesel electric, and gas turbine locomotives (incorporating a regenerator) shows about the following relationship:

Type of Locomotive	Thermal Efficiency at Rail	Fuel Cost per 1000 Rail HP Hrs.	Fuel Cost
Modern Steam Locomotive.....	7%	$5.47	$4.05/ton
Diesel Electric Locomotive.....	27%	$6.82	10 cts/gal.
Gas Turbine Locomotive—Oil Burning....	21%	$6.10	7 cts/gal.
Gas Turbine Locomotive—Coal Burning..	20%	$1.91	$4.05/ton

As applied experience is accumulated it is expected with some certainty that coal burning gas turbine locomotives will find economical application compared to Diesels.

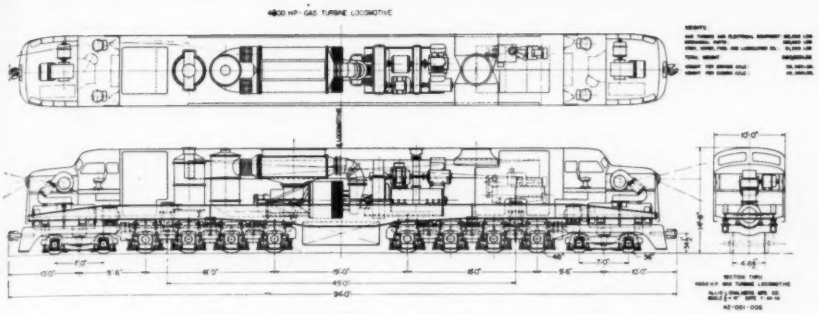


Fig. 3. 4100 HP Gas Turbine Locomotive.

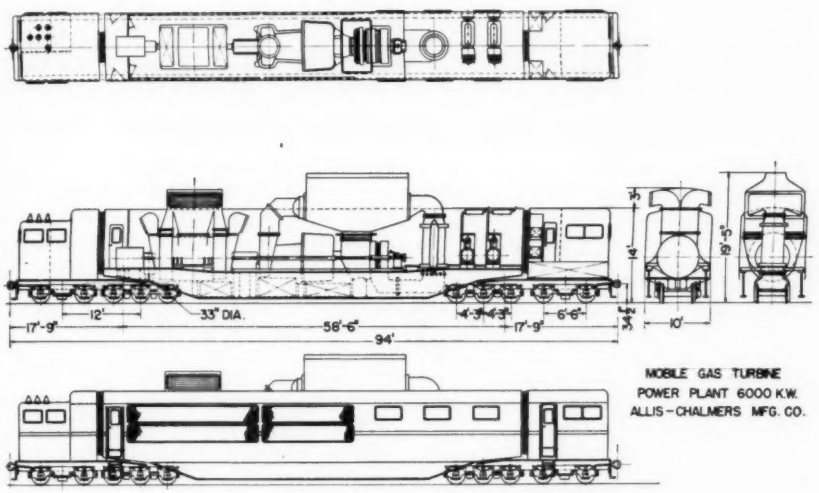


Fig. 4. 6000 KW Mobile Gas Turbine Plant.

Because a gas turbine power plant can be started within a comparatively short time from cold to delivering full power, this kind of prime mover is also well suited for standby power plants. Instances are known where stationary as well as a locomotive gas turbine frequently have been started in less than 10 minutes time. In time of natural disturbances, such as hurricanes, floods, war, etc., mobile power plants are very desirable. The gas turbine being inherently a high speed machine permits high ratings to be installed in the available clearance diagrams of the railroads. Fig. 4 shows such a mobile gas turbine power plant for 6000 kw continuous rating. This power plant is for operation with bunker oil and it needs no water. An outside connection is made to an electrical power system, and an oil line leads to a tank car located nearby. The parts of the plant projecting above the railway clearance lines are taken off during transportation and applied again when the new place of operation is reached. Being equipped with a regenerator, this power plant with 80 F ambient temperature, 1000 ft. altitude and 1300 F gas temperature will have a fuel to generator terminal efficiency of about 23 per cent. Running gear and air brakes are incorporated in the design to permit transportation of the unit over any standard gauge railway system. Its total weight is about 500,000 lbs. or 50,000 lbs. per axle.

It is believed that the above description and the illustrations of applications of gas turbine units show that a wide field lies open for the future use of gas turbines on railways.

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The September issue contained a New Products note about Acrow Adjustable Steel Shores as follows:

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So a Portland, Oregon firm, seeing the article, wrote to the London manufacturer for information.

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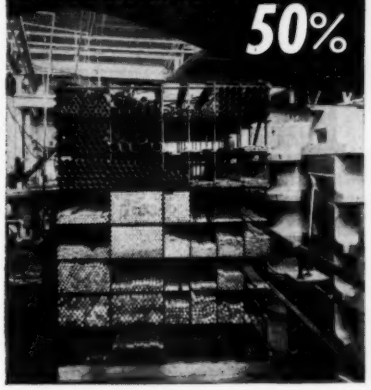

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FOR MORE EFFECTIVE USE OF COAL

The Steam Turbine-Electric Locomotive

A revolutionary type of locomotive that converts coal into electrical energy for its wheel drive deserves an important place in any discussion of prime movers.

The first steam turbine-electric locomotive — and the world's largest passenger locomotive — has been developed by the Chesapeake and Ohio Railway Company.

The steam turbine-electric engine was born of the C & O program to develop more effective use of bituminous coal, which, in 1946, accounted for 65 per cent of the railroad's freight revenue.

The design was worked out by the C & O Mechanical Department and the Baldwin Locomotive Works, the builder. It combines three well-tested principles — those of the steam boiler, the steam turbine and electric drive.

In arrangement, the steam turbine-electric locomotive reverses customary design. Constructed as a single unit 90½ feet long, it houses a 29¼-ton coal compartment in its streamlined nose. The operating cab is between the coal compartment and the boiler, and has windows on each side, facing ahead. It is equipped with swivel seats for the engineer and fireman. Both the operating cab and power unit cab are constructed of aluminum.

Coupled to the locomotive is a 25,000 gallon water tender. Wheelbase of the locomotive and tender measures 140 feet, 3¾ inches. The weight of the engine alone is 411½ tons. It is the largest in any type of service east of the Mississippi, and the largest single-unit engine in use anywhere.

Coal is stoked automatically into a 310-pound pressure boiler, which generates steam that is superheated and introduced into the 6,000-horsepower turbine. The turbine is geared down to two main generators having a combined capacity of 4,000 kilowatt hours of electrical energy.

The generators power eight driving motors hung on axles underneath the alloy cast steel frame. These driving motors produce a total of 4,960 horsepower on the eight axles and 16 driving wheels of 40-inch diameter—the same size as the 12 running wheels.

All journals of the locomotive and water car axles use roller bearings to permit a smoother, swifter start and the whole chassis is automatically lubricated by an electrically operated mechanical oil system.

The brake, especially developed for high speeds, is regarded by designers as the finest on any locomotive. Until now, air brakes have been air operated only. The brake on No. 500, which will soon go into service on the C & O, is both air and electrically operated so that it is applied on all cars instantly.

No. 500 is one of three 6,000-horsepower prime movers designed to pull the C & O's two fast, luxurious trains being constructed for daylight service between Washington and Cincinnati. Having a top speed of 100 miles an hour, these locomotives will make the run in 11 hours and 45 minutes, clipping nearly two hours off the fastest time for this C & O run at present.

Sheathed in aluminum with horizontal blue striping, the locomotive has sweeping lines that will harmonize with the lightweight passenger cars of the new trains.

The steam turbine-electric locomotives represent one of the most forward-looking improvements in the 125-year history of the steam locomotive. In a further effort to improve the efficiency of coal in providing motive power, the C & O is currently engaged in research to develop a gas turbine that, in operation would parallel gas turbine propulsion of airplanes.

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The world's largest single-unit passenger locomotive, recently built for the Chesapeake and Ohio Railway, combines for the first time in railroad history, the steam boiler, the steam turbine and electric drive.

Speaker Calls Coal-burning Gas Turbine Diesel's Main Competition

The coal-burning gas turbine locomotive is the most serious competitor to the presently popular Diesel locomotive that has yet appeared on the railway scene, according to Dr. John T. Rettaliata, Dean of Engineering at Illinois Institute of Technology.

Dr. Rettaliata spoke at the Annual Indiana Coal Conference in Terre Haute, Indiana, on September 24, 1948, sponsored by the Indiana Coal Preparation Utilization Society and the Ohio Valley Section of the American Institute of Mining and Metallurgical Engineers.

A leading authority on gas turbines and jet propulsion, he was, until September 1, Director of the Department of Mechanical Engineering at Illinois Tech.

"Unquestionably the numerous advantages of the Diesel engine make it a very desirable type of power plant for locomotive use," Dr. Rettaliata stated. "Tangible evidence of this is readily apparent from the overwhelming majority of Diesel locomotives on order compared with those of the steam type. However, it is believed that the gas turbine, especially when using coal as a fuel, possesses even more beneficial characteristics when applied to the heavy traction field, and it is predicted that only by its adoption will the ultimate in locomotive design be achieved," he said.

A 4000 horsepower coal-burning locomotive gas turbine now being constructed will soon be ready for testing, and if the anticipated performance is realized, fuel and maintenance costs will be lower than for any other locomotive ever built. A direct-current type of electric transmission, similar to that used in Diesel-electric locomotives, will be employed.

The gas turbine power plant consists of a turbine driving directly a compressor and also, through a reduction gear, a generator, the latter furnishing electric power to traction motors mounted on the axles of the locomotive. Air from the atmosphere has its pressure increased by the compressor and, after passing through a combustion chamber where its temperature is raised to about 1300 degrees Fahrenheit by the burning of pulverized coal, enters the turbine in the form of a hot gas. By expansion of the gas through it the turbine develops more power than the compressor requires so the excess goes to the generator. A heat exchanger will also be employed so that the turbine's exhaust gases, which would otherwise be wasted, can be used to preheat the compressed air before it enters the combustion chamber.

The expected fuel cost, when using coal, will be approximately one half that of a Diesel locomotive of similar horsepower. The lubrication costs should not exceed one tenth of those of the Diesel type. The purely rotary motion of the gas turbine will result in minimum maintenance and vibration. Absence of any reciprocation, with its concomitant unbalanced forces, is obviously beneficial. Several other gas turbines, of a design similar to that of the locomotive unit, have operated in oil refineries for continuous periods as long as several years without shutdown; thus indicating the high order of reliability to be expected from the locomotive gas turbine.

There are other incentives for using coal besides fuel costs. One of these is that the chief source of revenue of some railroads is obtained from hauling coal, and good customer relations are, obviously, important. From a conservation standpoint the use of coal is also dictated. It is generally predicted that coal reserves will last about 3000 years as compared with 15 years for oil. Even if the latter figure is appreciably in error, the tremendous difference in favor of coal is evident.

Since no water is required in its operation, the gas turbine cycle should be particularly attractive for locomotive installations. Elimination of the new necessary water treating provisions for both Diesel and steam locomotives should certainly be desirable. The large amount of excess air used in the gas turbine combustion process permits a clear stack free from smoke at all loads on the unit. The desirability of such a feature in view of some present city ordinances is manifest.

Harvester

(*Continued from Page* 14)

Two new six-cylinder engines were developed during the war emergency, and have been added to the line. These new models, together with power-adding improvements in the earlier engines, give International Harvester a range of Diesels suitable for a wide variety of stationary and mobile, farm and industrial applications.

To International Harvester pioneering is a continuous operation. Diesel research is still one of the company's most important development projects. Today, the small bore, high speed Diesel engine has a steadily expanding sphere of application. International Harvester intends to continue contributing to the development of the Diesel engine as its answer to requirements for low-cost, dependable power for industrial and agricultural applications.

METROPOLITAN CHORE . . . .

Fifty Million Commuters a Year

H. S. Symon
Superintendent of Passenger Service, Illinois Central Railroad

Randolph Street!!!!—on the Illinois Central Railroad this means the control center for one of the world's busiest commuter services. The Randolph Street Station is the main downtown Chicago terminal of the Illinois Central's electrified suburban lines—from this terminal are handled 482 trains daily, 418 of which are Illinois Central commuter trains and 64 Chicago South Shore and South Bend Railroad trains.

During the 5 to 6 p.m. rush hour 74 trains move in and out of the terminal. This is more than one a minute. The week-day volume of passengers—more than 170,000—handled by the Illinois Central is near the equivalent of handling the population of the entire state of Nevada twice each day. Of every 12 persons boarding a train on an American railroad, one is an Illinois Central suburban passenger.

The first suburban train was operated by the railroad on July 21, 1856, and connected the little outlying village of Hyde Park with Chicago. As Chicago grew, suburban frontiers were pushed farther and farther out, and the railroad expanded its facilities to keep pace with the demand for its service.

In contrast to the 6-mile run to Hyde Park in 1856, the main line suburban service now operates to Matteson, a distance of some 28 miles. The service is also operated over two branches, a 4.7-mile double track from Sixty-Seventh Street on the main line, serving the South Shore and South Chicago areas, and a 3.9-mile single track between Kensington, on the main line, and Blue Island. Another branch, a short single track, is used for race track specials from the main line at Harvey to the Washington Park race track, adjoining Homewood.

Southbound Illinois Central electric suburban train leaving Roosevelt Road Station.

Interlocking Plant

The keystone of the entire suburban system is the interlocking plant and power control system at Randolph Street. A mere push of a button in the power room and current can be cut off in any section and at any place on the system. Train movements at Randolph Street are controlled by men who cannot see the tracks or the trains they are dispatching. All switches and signals are interlocked, the control equipment being housed beneath the waiting room, in a space unseen by the thousands of patrons who pass through this terminal each day.

Because of the great number of movements involved, it is of paramount importance that each train arrive at the proper platform on time and that trains be loaded according to a prearranged schedule. Success in properly handling the great number of movements depends upon the close co-operation of the several men concerned and upon the integrity of the facilities provided. Supervision of the operation is in the hands of a yardmaster, located in the interlocking room.

The men who are responsible for getting trains in and out of the terminal are working on a remote control basis. Hence, in addition to the usual safety features, it was necessary to devise and provide additional electrical indications to inform operators of what is happening at all times. This special equipment has been designed with the idea of maintaining fast and efficient operation with the least possible delay in case of trouble.

Has 136 Levers

The interlocking machine has a 136-lever frame with sixty-eight working levers for six double slip switches, thirteen single switches, one derail and thirty-six signals. There are nine spare levers and fifty-nine spare spaces in the machine for future expansion of the plant when additional tracks are constructed.

The levers are equipped with circuit controllers, indication magnets, electric locks and vertical locking tappets which are notched to engage horizontal lock-

ing bars in such a way that levers may be operated only in a predetermined sequence. This is to prevent the possibility of setting up conflicting routes or clearing of opposing signals. The switches are lined up first, and then the signal is cleared, the signal lever locking all the switch levers in the route it governs.

In addition to the mechanical locking in the machine, routes are controlled, interlocking levers are locked, and switches are locked electrically by the presence of a train upon a given track circuit controlling a track relay, which in turn interrupts the circuits of such locks, making them effective.

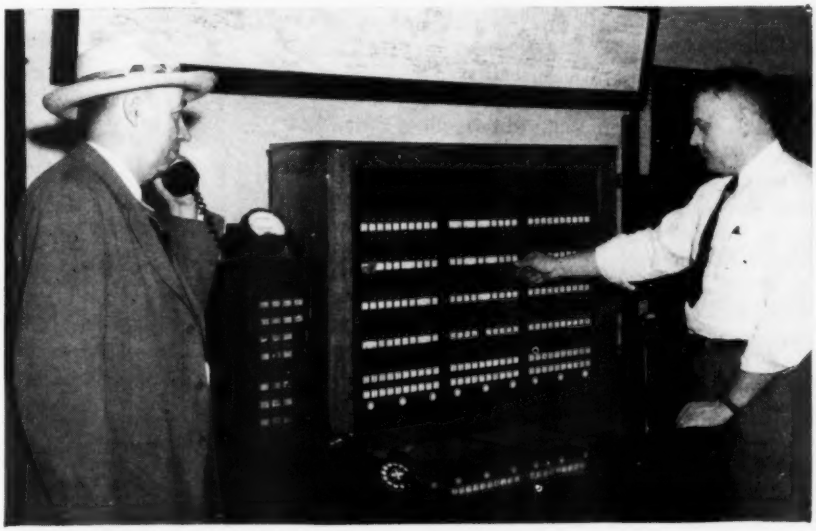
Other Safety Features

Another important safety feature is the means provided to check the correspondence of movement between a lever and the switch or signal controlled by it. In the case of switch levers this requirement is met by means of a momentary dynamic current generated by the momentum of the motor of the operated switch, which gives the desired indication at the lever end of the circuit when the switch has completed its movement. Signal lever indicating magnets are energized by a 110-volt alternating current received through a back contact of the control relay as soon as the signal displays the stop indication. Each switch is arranged to reverse the polarity of a polarized relay according to whether the switch points are in the full normal or full reverse position, and every signal governing train movements over the switch is controlled through the polar contacts of this relay to assure that a route is set up before the signal can be cleared.

Double lamp cases are provided on the interlocking machines over signal levers, a white lamp to indicate when the signal is clear, a red lamp to indicate when the signal is set at stop. Switch levers are equipped with a single lamp case which indicates, upon lifting the latch, whether or not the switch lever can be reversed or restored.

Restoration of a signal lever to the normal position before an approaching train has entered the track circuit is prevented by controlling the signal indication circuit through a time-locking relay having a five-second pickup, with a multiple circuit through a back contact of the track relay. A detector lock circuit for each is controlled through the track relay of the section in which the switch is located to prevent the throwing of the switch under a train. Route and section locking may be released in emergency by breaking a seal on a special releasing device which must be restored to normal before the signals can be restored again. Each circuit for signal control is protected against crosses by an individual polarized relay equipped with a red light to indicate when the relay is open.

The machine that keeps the trains on the right track—the interlocking machine at Randolph Street Station. This machine guides the handling of 482 movements daily in and out of the busy station.



Power control panel at Randolph Street. From this panel overhead power circuits can be restored at any point on the suburban system by a mere press of a button.

Electrical Melters

Every switch is equipped with electric snow melters, which may be turned off or on by means of a push button in the interlocking room. These heaters melt the snow as it falls or blows into the switch points and thus avoid the difficulties which would result during snowstorms if switches in this congested territory were cleaned by hand.

The positions of trains are indicated to the yardmaster and leverman on a track diagram on which small spotlights mark the occupied sections of track. This diagram is mounted above the interlocking machine.

In order to give the yardmaster advance information as to the order in which northbound trains on each track are approaching Randolph Street, a special train-announcing system has been provided to facilitate the movement through the interlocking plant to the proper platform.

For southward movements it was necessary to provide a simple and flexible system of intercommunication between

(*Continued on Page* 22)

METROPOLITAN CHORE . . .

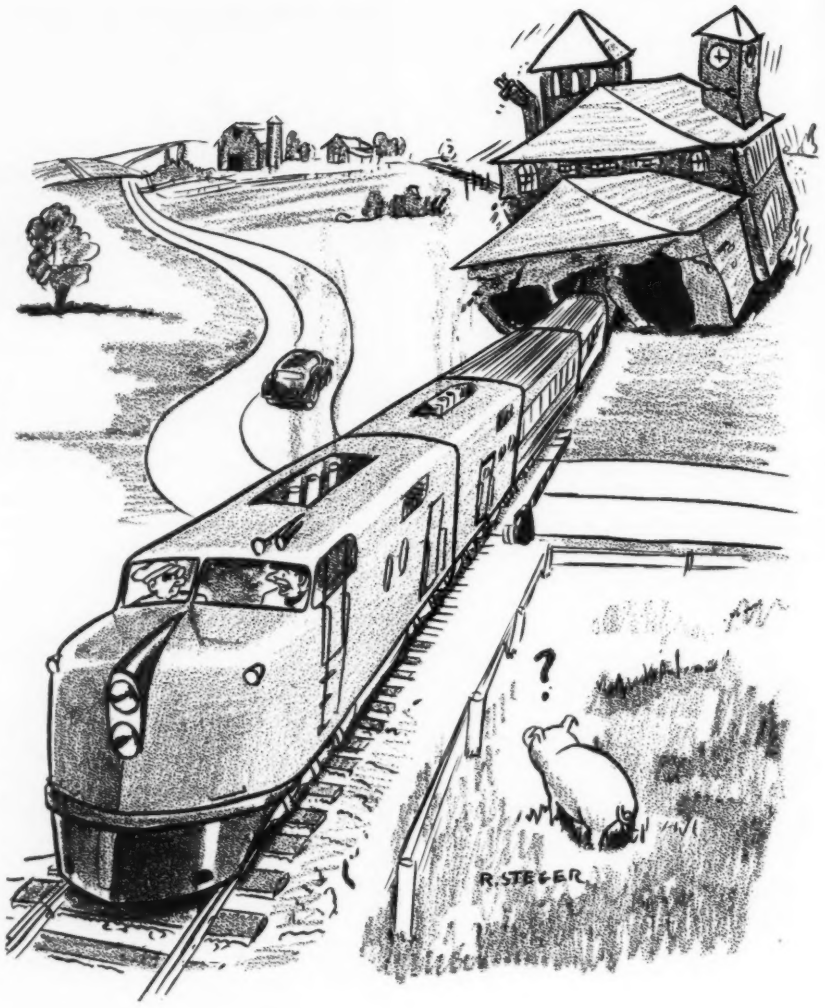
(*Continued from Page* 21)

the yardmaster in the interlocking room, the train conductor on the platform, and the doormen up in the station waiting rooms at Randolph Street and South Water Street to assure mutual understanding with minimum delay, avoiding the use of the telephone as much as possible. A system of push buttons, light indicators and buzzers was developed which eliminates the necessity for acknowledging signals and provides burned-out lamp protection.

From the control panel at Randolph Street a circuit in the overhead power lines can be restored at any point on the suburban system merely by pushing a button on the power control panel.

The Illinois Central suburban operations differ from similar operations of other railroads in that, while suburban trains use the same right-of-way as the through trains, six tracks are set aside exclusively for handling commuter trains. The vast flow of passengers during rush hours or attending special events (such as activities at Soldier Field, the Century of Progress, Railroad Fair, parades, concerts, etc.) requires great flexibility in the scheduling of trains. The problem is always to have enough equipment in the right place at the right time—this is made doubly difficult in view of the fact that present day traffic volume makes it necessary to operate suburban cars in excess of 125% of capacity during rush hour periods.

Operations of this type are attended by financial problems, too. Investment in special equipment, overhead catenary system, and right-of-way, runs into tens of millions of dollars. Also it must be remembered that in operating a commuter service the Illinois Central traverses an area of homes, apartments and hotels. Unlike other railroads it has been largely unable to develop industries along its lines within the city. One great advantage of the Illinois Central's location, however, is that, contrary to the usual entry of a passenger into the city through slums and industrial districts, the Illinois Central delivers its patrons at Chicago's front door after a ride along a park and lakefront. It has by far the most scenic approach into the city.



See—doesn't the Diesel have amazing pickup?

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Waste Group

Holds Fourth Annual Conference at Purdue

The Fourth Industrial Waste Conference, sponsored by the Indiana State Board of Health and Purdue University, was held September 21 and 22, at the university.

The annual conference, largest of its kind in the world, had as its chairman, Professor Don E. Bloodgood, Professor of Sanitary Engineering at Purdue University.

The new Ohio River Valley Water Sanitation Compact received much attention both on the official program and in private discussions during the conference. This interstate treaty had been signed on June 30, 1948, by the Governors of Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia. There are precedents for such compacts in England and elsewhere, but the new treaty represents a far-reaching development in public measures of this kind. The Compact Commission consists of representatives of each member state and of the federal government. This commission is now working and active; it has its main office at Cincinnati, Ohio, where much of the engineering, chemical and biological work, either advisory or otherwise, is going to be done. The principal function of the commission is to coordinate the activities of the member states, towards elimination of objectionable wastes from designated public waters. Different types and degrees of treatment will be required, depending on local conditions.

The Federal Water Pollution Act, Public Law 845, was discussed in several unofficial groups and mainly by Carl E. Schwob, Sanitary Engineer Director, Water Pollution Control Section, U. S. Public Health Service, Washington, D. C. Under this law the Surgeon General of the United States is expected to notify the responsible parties, if he determines that interstate waters or tributaries are being polluted. He will then recommend remedial measures, and specify a reasonable time for abatement of pollution. With the consent of the state he may start an enforcement procedure. It is also expected that a kind of clearing house for technical and other ideas will develop when this act goes into effect. Appropriations between 20 and 30 million dollars are authorized, for the purpose of aiding in the construction of necessary treatment works, and related activities. Actual appropriations will be up to Congress.

When will you ever learn to get them on the right road?

Featured addresses of the conference were delivered by William J. Eldridge, Supervisor of Water Treatment and Sewage Disposal of DuPont at Old Hickory, Tennessee, and by F. W. Kittrell, Chief of the Stream Sanitation Staff, Health and Safety Department of the TVA at Knoxville, Tennessee. One of the problems discussed was that of establishing the necessary cooperation between the states and industries. There are at least some concerns in almost every industry who insist, through their legal departments, on keeping practically all competitive and operating data secret. Some standards as to items of information that should or should not be expected are gradually emerging.

Group meetings were held on the following subjects: dairy wastes, fermentation process wastes, food processing wastes, metal wastes (cyanide process, etc.), oil wastes (from refineries, machining plants, etc.), miscellaneous wastes (pharmaceutical, paper pulp, etc.), and analytical and testing procedures.

Proceedings of the conference, including a transcript of the lectures and discussions, can be ordered from the Indiana State Board of Health at Indianapolis.

Science Association Appoints Board

The American Association for the Advancement of Science has appointed an editorial board of five distinguished scientists who will serve with a Yale biologist to direct the activities of the two publications of the organization—"Science" and "The Scientific Monthly."

This announcement was made by Edmund W. Sinnott, President of the A.A.A.S. and Director of the Division of Sciences at Yale University.

Chairman of the editorial board and editor-in-chief of both publications will be George A. Baitsell, Colgate Professor of Biology at Yale. Professor Baitsell is now Executive Secretary of The Society of Sigma Xi, The Scientific Research Society of America, and is Editor of "The American Scientist," official publication of Sigma Xi.

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National and Local

EMPLOYMENT OUTLOOK

M. V. Sommer
President, Illinois Board of Private Employment Agencies

Long before the professional forecasters get around to analyzing employment trends and compiling statistics, private employment agencies know from first-hand, current experience, just what is happening. Actually, a new employment cycle may be under way by the time the facts for a given period are made public, and this is reflected by the number and types of workers requested by management, as well as the number and types of applicants seeking employment. Consequently, private employment agencies not only constitute the greatest pulse-feeling medium of employment conditions in America, but afford a week by week, month by month barometer of fluctuations within a cycle.

The Illinois Board of Private Employment Agencies and the National Employment Board have each had more than thirty years' experience in taking the employment pulse of the nation. They form a liaison between employer and employee, in every kind of business throughout the United States. They screen and place the so-called white collar workers, such as executives, accountants, purchasing agents, personnel managers, chemists, salesmen and workers in many other categories, with salary brackets ranging from $1,800 to $30,000 per year.

Requests Diversified

As a result, industries and businesses which turn to the private employment agency for qualified, white collar help are so diversified, that their composite employment needs give a fairly accurate picture of employment conditions as a whole. For example, the contacts made during a single week may include organizations concerned with automobiles, steel, rubber, chemicals, engineering, accounting, mail order merchandising, and sales.

In securing accurate information on job requirements and the needed qualifications and experience of employees to fill these jobs, it is necessary to talk with executives of each company. These include, according to divergencies in organizational set-up, the president, general manager, factory manager, comptroller, sales director, chief engineer, personnel manager and office manager. Through these talks, the counsellor learns the employer's needs, his problems, the general situation as he sees it, and how it affects his company. Thus, a very definite and factual story is unfolded — a story that is known to the private employment agency from Maine to California, with special emphasis on the immediate, local situation.

Fit Local Conditions

For instance, any forecast of employment conditions for the ensuing six months, as related to the white collar worker, must be tailored to fit local conditions. As an illustration, the supply is always greater in New York than in Chicago, because America's largest city draws on a more thickly populated surrounding area, with an additional influx from all over the nation, due to its over-advertised bright-lights lure. In like manner, each city has its own individual local problems and conditions, of which the private employment agency is keenly aware.

Since local conditions, as a rule, conform in degree to the general trend, let us take a look at the national picture. At this writing, it seems a safe conclusion to state that general business activity and general employment should continue at a high level, throughout the nation, during the remainder of 1948 and well into 1949. Many less cautious predictions extend this forecast to a much longer period. There are many tangible factors, however, to support the premise that general employment will be high for at least another six months to a year.

1. Our national income, which reached an all-time high of $190,000,000,000 in 1947, is steadily rising. If the present rate of increase continues, the figure for 1948 will be higher by $25,000,000,000.
2. Employment is now at a record peak. Accurate figures are not available, but estimates are that some 61,000,000 to 62,000,000 people are now gainfully employed.
3. Government spending under the Marshall Plan is beginning to make itself substantially felt. A look at orders placed here by foreign countries with our heavy industries illustrates the point. Vast sums are also being spent for soft goods and food shipments abroad.
4. Our stepped-up military program involves huge expenditures for all three branches of the armed forces. This includes mechanized equipment, planes, ships and maintenance.
5. On the man-power side, the military draft of young men between the ages of 19 and 25 will cut into the reservoir of candidates for jobs.
6. Out of the army of veterans now attending college, only 300,000 are expected to leave between now and June, 1949. It will be 1950 before we have a substantial number of college-trained GI's looking for quick futures. These men will be draft exempt, theoretically.
7. The continued willingness of business firms and industry to spend money for expansion and improvements, and to seek educated, trained employees, will help to keep the employment curve up.
8. The volume of consumer spending is mounting. This stimulates employment in companies producing products for retail outlets.

This brief condensation of general economic and employment factors fore-

shadows a continued tight labor market. At the same time, however, we find that employers have reversed their wartime attitude, when they would take on almost anyone who could walk and talk. They have sharpened their pencils and are far more specific and exacting in their requests. They want their money's worth — employees who are capable and energetic, willing to do a fair day's work for good pay.

Generally speaking, there are fewer positions open for the white collar worker today than there were a year ago, though this could change with comparative suddenness. Strangely enough, there is also no increase in the number of available, qualified applicants. It is surprising what a large number of capable people still take unemployment compensation for months before looking for a new position. This accounts, in part, for a dearth of applicants.

Applicants Scarce

Though employment is high today and applicants scarce, employers are more concerned with quality than quantity. Personnel directors are attempting to solve this problem in various ways, according to their own light and the specific conditions which govern them. The following case, while it illustrates a technique that is often used, is particularly applicable in the present labor market.

The personnel director of a large national organization, who had been educated as an engineer and therefore thought in terms of man-hours per job, conducted an employee survey. The three things he sought to learn were these: (1) How contented were employees with their jobs? (2) Did they have enough work to keep them busy eight hours a day? (3) Would they take on more work if paid more money?

The results of this survey were highly gratifying. First of all, the old-timers — those with more than five years of service — were contented and would go along with the company program. In other words, they were sure of their jobs, and had become adaptable through their long years of service.

The majority expressed a willingness to take on more work, particularly those who were familiar with routines and short-cuts. The money incentive proved to be strong. Sixty-five per cent stated that they wished to earn more and would assume extra work to achieve their objective.

Most of the employees who had been with the company less than five years, especially those with the shortest terms of service, felt that they were underpaid, by comparison with older employees.

An analysis of the white collar jobs had this result: Salaries were increased from 10 to 25 per cent, as justified by individual cases. Personnel was reduced by approximately 20 per cent, thus releasing employees for openings with other companies. Despite the increase in salaries, the total payroll was thus reduced. Those who remained at higher wages were more contented, understanding fully that management expected them to turn in a good performance for the extra compensation. The fair attitude adopted by this company became known and boosted its prestige. They have had no trouble since in getting efficient white collar employees.

This case demonstrates that it is possible to maintain maximum production with fewer employees, a plan that is likely to come into wider practice if present employment conditions are maintained, or become more acute. It is also indicative of a new attitude that is becoming more prevalent among employers, who are seeking a higher degree of competency among white collar workers. They are willing to pay satisfactory wages but expect a performance that will justify the payroll. In other words, the former coddling of employees by management is rapidly becoming a thing of the past. This practice was economically unsound, in terms of production, and contributed very little to the morale and loyalty of employees.

Cooperation Necessary

Mutual respect and cooperation on both sides is the ideal combination, of course, and there are many authenticated signs that the trend is in this direction. The lackadaisical attitude manifested by workers during the war is being replaced, to an appreciable extent by diligence and a genuine interest in the job. Though the long-discussed and deeply-feared post-war depression seems more distant than ever, the possibility of an eventual calamity is causing workers to think in terms of security. If they apply themselves to their jobs now, they reason, they will be in a favored position if and when the bubble does burst. Thus, it appears, both employer and employee are becoming more serious about the employment outlook.

In summary, we would say that, while no one can infallibly predict the future, there is every indication that we will have peak levels in employment for some time to come. Real labor shortages may occur in 1949, due to the expansion of draft and armaments programs. In anticipation of this possibility, there is already talk of the eventual need to lengthen the work week, with over-time pay; a drive to induce married women, who worked in industry during the war, to return to similar jobs; and a survey of employable handicapped people, who may be counted on to boost the total supply of workers.

More Workers Needed

It is true that with a greatly expanded national economy, involving steadily rising industrial production, a mounting demand for consumer goods, and an increase in all types of services, we will require additional numbers of white collar workers. It is they who give the directives, make the blue-prints, plan personnel requirements and handle the vast amount of paper work necessary before the giant industrial machine can begin to function.

Even so, we do not expect to see an appreciable shortage of white collar workers during the next few months. The new attitude — or shall we say the new sanity? — will keep present employees on the job, performing at maximum efficiency. The need for new employees, which will arise as expansion of business and industry moves forward, can probably be met by the careful screening of available applicants by the private employment agency.

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Auction Market for American Savings

The New York Stock Exchange

First in a series of articles on the American free enterprise system

Emil Schram

President,

New York Stock Exchange

At the outset, permit me to say that Wall Street is not just a place. It is not a group of persons. It is not a state of mind. Rather, Wall Street is all of the Main Streets of our cities and towns. At the same time it is a piece of economic and social machinery essential to a capitalistic or free enterprise system.

No one conceived Wall Street in a blueprint. No one copied it after some prototype. It is not the result of legislation. Wall Street over the years has evolved as a spontaneous service station to bring together those who accumulate capital and those who know how to put it to productive use. Money accumulated is worthless both to the owner and to society until it is put to work. Wall Street puts money to work.

Diverse Personnel

The personnel of Wall Street is drawn from every state and almost every community in the nation. Among the executives, technicians and clerks who make up the financial community, one finds men and women of all occupational origins.

Some people think of Wall Street as a place where a few powerful men, perhaps a score or two, make joint decisions in their own self-interest and control the property and the prosperity of the nation. Nothing could be farther from the truth. If I were asked to name the ten most powerful persons in the financial communities of this country, I would not know where to begin. There was a time, years ago, when a few men did wield great power; but that was before the country became so big, before the economy became so complicated, and before the nation became so highly industrialized. The days of Jay Gould, Jim Fiske and others are distant history. The country simply outgrew them. They have no modern counterparts.

Individuals Lack Funds

Few people stop to think of the place of the large corporation in American life. No individual, or small group of individuals, has sufficient resources to provide the funds to equip this country with telephones, to establish a new automobile company, to build large steel mills, or to establish a nation-wide mercantile chain.

Something over 723,000 people are registered owners of American Telephone Company stock. How many shareholders of General Motors?—430,000. Of United States Steel?—243,000. Of Standard Oil of New Jersey?—170,000. One bank out on the Pacific Coast, Bank of America, has 151,000 stockholders. The list could be extended endlessly.

Wall Street raises the money to provide many millions of jobs. On the average it requires $18,500 to make a job in the paper industry, $17,300 to make a job in a chemical plant, $6,900 in a printing establishment, $6,600 in a rubber factory, $5,000 in the nonferrous metal industry, $2,600 in the lumber business and about $2,400 in the leather or textile trades.

Roughly, each employee of Standard Oil of New Jersey is working with $25,000 of invested capital; each employee of International Paper with between $9,500 and $10,000; each employee of U. S. Steel with about $6,300 and each employee of General Motors with around $8,000.

Where does Wall Street get the capital? Last year the life insurance companies of the United States collected some $6 billion in premiums. Roughly half of this money, after paying dividends to policyholders, death benefits and expenses, was invested in bonds, —much of it in corporation bonds. In many cases, insurance companies came to Wall Street and bought entire bond issues from investment houses, or through transactions negotiated by investment bankers. In those cases, it is possible that millions of policyholders, through their insurance companies, invested in bond issues.

There are two kinds of capital, or two broad classifications which overlap. Millions of small investors, who seek safety and high liquidity, are satisfied with a moderate yield. They put their money in a savings bank or in government bonds—or in life insurance. Government agencies and corporations sell bonds, which are merely evidences of debt, both to private investors and to institutions seeking to invest money with a minimum of risk. At present there is an adequate supply of this type of money, since the country is prosperous and many small investors have a surplus over living expenses.

The other kind of capital is venture capital, or "risk money"—money invested in ownership of a corporation, usually in common and preferred stocks. While small investors buy common stocks at times, although usually sparingly, the big source of risk money is the man in the higher income brackets who is able and willing to assume a large risk in the hope of a good return.

Risk Capital Short

Because high incomes are heavily taxed, there is, at present, a shortage of this type of capital. Wealthy people, who formerly supplied it, have little surplus after taxes, living expenses and other obligations.

As a result, just now bonds are high and stocks are not in great demand. This is not a healthy situation, since it encourages corporations seeking additional funds to go in debt rather than to seek equity capital through the sale of additional shares. There is an alarming shortage of "venture capital," and a

free economy does not progress unless there is money available from people who are willing to risk their funds in promising enterprises and undertakings.

The New York Stock Exchange provides an auction market for the shares of American corporations. These shares of approximately 1,000 corporations are listed and traded in on the Exchange. Since some companies have more than one kind of stock outstanding (a common and one or more of preferred), we provide a market for approximately 1,400 different issues. In addition, we have in our trading list about 900 different bond issues, the obligations of some 390 different issuers. At the end of February, 1948, the total market value of all bonds and shares listed on the New York Stock Exchange was more than $199,000,000,000.

The rate of turnover in these securities is amazingly slow, showing that most Americans who buy stocks and bonds, invest rather than trade. Last year only about 14% of all the shares listed changed hands. In our biggest trading day in 1947, only 1/10th of 1% of all the stocks listed changed hands. This means that, at the highest daily rate of activity in the past 12 months, it would take 833 sessions, or about 2-¾ years to make our listings change hands once. People who mistakenly think of the New York Stock Exchange as a "gambling" institution will be surprised at these figures.

Exchange Procedure

It is interesting to note how the New York Stock Exchange brings buyers and sellers together. A man in Joplin, Missouri, may go to his bank tomorrow morning and give an order to sell 100 shares of St. Joseph Lead common stock. The bank probably won't have a buyer, but it will telephone to an office of the New York Stock Exchange firm with which it does business and offer the stock for sale. The order will be relayed promptly to the floor of the New York Stock Exchange. There, another firm, with an office in, let us say, Seattle, Washington, will have an order to buy 100 shares of the same stock. In a matter of a few minutes, or less, according to the quickness of communications, the deal is consummated.

On the New York Stock Exchange meet the investment orders to buy and sell, and there the opinions, the emotions, the hopes and fears of investors all over the United States and in foreign countries are reflected.

Before the New York Stock Exchange accepts a security for listing, the company meets certain rigid and well-defined qualifications. One of them is that there must be a sufficient number of shareholders to indicate a substantial market interest in the security; another is that comprehensive financial statements must be made public annually, earnings statements quarterly, and that other pertinent information, without which the investor could not judge the

Emil Schram

value of the stock, must be made conveniently available. We do not "approve" or "recommend" any security, nor do we make any representations as to its quality, but we do try to see to it that the investor has a means of knowing just what he is buying. We urge the investor to "investigate before he invests."

The Stock Exchange does not pretend to be the primary source of new capital funds. Such funds are often provided, however, through the Exchange by the exercise and sale of subscription rights —that is the right of a stockholder to subscribe for additional securities offered by his company. But, new capital is raised principally through the sale of securities by investment bankers to the investing public and to institutions.

The New York Stock Exchange is an essential part of our investment machinery because it provides a ready market where investors and speculators may turn their securities into cash or put their cash into securities that have met the listing requirements of the Exchange. Investors as a rule do not put their money into securities unless they know that there is a market where they may sell, without delay, at the best available prices. Transactions on this Exchange are immediately made public. This is accomplished through some 2,300 tickers throughout the nation, and the information is published in the financial tables of our daily newspapers. The amount of trading and the prices are a matter of public record. The process of providing capital for industry and business requires a market such as that on the New York Stock Exchange.

In a free economy such as ours, organized securities markets and a highly specialized investment business are indispensable. They are necessary if free enterprise is to survive and if the nationalization of industry is to be avoided. Such a nationalization could easily merge into a police state.

The past century has been a period of far-reaching and exceedingly rapid progress in the arts and sciences. Efficient transportation, the development of easy communications, the wider dissemination of all kinds of knowledge, millions of machines, the growth of the population, the concentration of life in huge cities—in short, the industrial revolution and the delicate division and subdivision of labor which resulted from it—has made each life decreasingly isolated and increasingly intertwined with every other life. No family, no community, no segment of the national life, and no nation is economically and socially independent except at the cost of those advantages which the industrial revolution has brought us.

The great economic and social progress we have attained in America is a product of freedom, not the result of planning and regimentation.

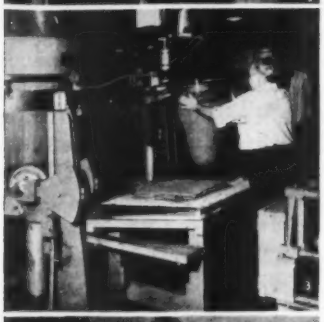
Cooperative Experiment

Ours is a great cooperative experiment in living together peacefully in freedom. This experiment, still less than 200 years old, is just as sacred to the welfare of the poor as to the wealthy, to the employee as to the employer, and to the man who has not as to the man who has. The big issue of this generation is the survival of freedom of person, freedom of soul, freedom of property, freedom of markets, and freedom in the choice of those who govern.

Putting the Rabbit

Irving K. Kessler
Manager of Employee Relations, John B. Stetson Co., Philadelphia

The man in the street, if asked to describe the steps in making a hat, would hem and haw for a moment, and would then provide the information that hats are cut from a strip of felt, placed into a mold, formed, trimmed and packed. Visitors at the John B. Stetson plant in Philadelphia are always amazed to discover that there are no bolts of cloth from which an operator can conveniently clip an embryonic Stetson. Actually, there are approximately 250 operations necessary in the making of a fine fur felt men's hat. These operations range from the simplest of manual tasks to highly skilled delicate craftsmanship. Obviously, a description of each of the operations would be impossible in an article of this length; hence, this article will be devoted to a consideration of the major steps in transforming rabbit skins into smart headwear.



Animal Fur Used

The basic material used in the body of fine men's hats is the fur of animals. It is generally considered that the best fur is obtained from the backs of land animals such as hare and rabbit, and from the under-bellies of water animals such as nutria and beaver. The reason for this is obvious since land animals require more durable fur to withstand the rigorous climate and fur on the bellies of water animals must be resistant to the coldest water. It may be noted, parenthetically, that there is no truth to the rumor that the driving ambition of all self-respecting rabbits is to wind up as a Stetson hat. This is merely hearsay and has not been scientifically authenticated.

If we could look at a single strand of animal fur under a microscope, we would see that there are hundreds of microscopically tiny scales on each fiber which resemble the shaggy bark of a tree. When carefully cleaned fur is matted together and manipulated in hot water, it is believed that these scales interlock, holding the fur together. If this mat is alternately dipped in hot water and gently squeezed, the fur fibers either by chemical or mechanical action creep closer together. This interlocking action is known as "felting."

With proper processing and manipulation the material shrinks down to about 1/3 of its original size and forms the smooth soft fabric which we know as felt. Although a certain type of felt can be made from wool at less expense, the best felts are all made from the soft furs of various animals. Much of the fur used in the men's hat industry comes from the rabbit. These skins are imported from Australia, England and Scotland and are known as coney skins. In the finer quality hats the fur of hares, nutrias, and beavers are used. The bulk of hare skins is supplied by Russia and Continental Europe with Argentina next as a major supplier. Beavers are trapped in the Northwestern United States and in Canada.

Unlike most industrial processes, the making of a felt hat cannot be strictly standardized. Although the basic operations involved in the making of hats of a particular quality follow a standard process, the results are not always standard. This is understandable when the nature of the basic material is considered. Felts from various animals do not shrink uniformly, nor do they "take color" in the dye process uniformly. The fur in the hat is considered to be "live" and at any stage in the processing may grow, creating a fuzzy effect or interfering with the processing. Because of the lack of uniformity in the basic nature of the fur, considerable skill is necessary on the part of some of the operators to bring about, through skilled workmanship, uniformity of results which will maintain the reputation for high quality standards which has been built up by Stetson over the years.

Into the Hat . . .

A further characteristic of the hat industry which results both from the nature of the product and its styling is the romance in the business, which is found only too infrequently in modern day manufacture. There is a characteristic love of fine hats to be found among experienced hatters—a pride in producing a hat that is attractive in appearance, supple and smooth to the touch ("mellow" in hatters' parlance), and durable in texture.

Operations in Hat Making

Carroting—After the long course hairs have been sheared or peeled off of animal pelts, an acid solution is brushed on the soft under fur to increase the "felting" action inherent in all furs in varying degrees. This step is called carroting. At one time carroting was performed with a solution of mercury and nitric acid. Unfortunately, the mercury would not confine itself to the fur pelt alone but would be absorbed by workers, leading to mercurial poisoning which manifested itself in convulsive palsy. Thus, the expression "mad as a hatter" had a basis in fact since the nervous systems of many hatters were permanently injured through mercurial poisoning. Fortunately, however, a satisfactory non-mercurial agent has been developed and the use of mercury has been banned in most states.

Cutting—Following the carroting operation the animal skin is run through a cutting machine which separates the hide from the fur. The fur is still in unusable condition since it contains long hair, stones, burrs and other foreign material not recommended for use in quality hats. The skins are salvaged, shredded and are sold to glue factories. Thus, a postage stamp and a Homburg have more in common than meets the eye.

Mixing—The cut furs of various types, which are called leading stock, are blended and mixed in correct proportions to produce a felt of the texture and quality desired. The basic fur content of a hat, which is one of the major factors in hat quality, is created at this point. Various types of fur are noted for their qualities of durability, texture and appearance, and so ultimate quality is built into the hat by the proper mixture of furs.

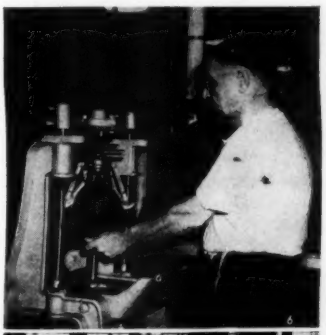
Blowing—The blended fur, after mixing, is passed through a blowing machine in which thousands of steel pins, mounted on rotating cylinders, tear the fur apart. The long hair and foreign matter being heavier fall to the bottom and are disposed of as by-products. The fine fur is then removed from the machine and is ready to be processed into a hat body.

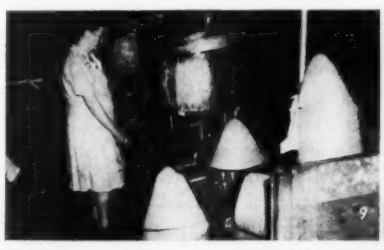
There are two basic divisions in hat factories: Back or "wet" shops in which hat bodies are formed and front shops in which the formed bodies are finished and trimmed. The "wet" shop is appropriately named since each of the operations necessarily is performed utilizing heat and water necessary to insure proper felting. The front shop is also known as the "dry" shop in contrast to the back or "wet" shop.

Forming—The intricate procedure in which fur becomes transformed into felt hats begins at the operation known as "forming." Operators called feeders accurately weigh out the necessary amount of fur (from 2 to 5 ounces) to form a single hat. The fur is carried on a moving belt and is blown into a large dome-shaped machine. Inside this dome is a revolving, highly perforated, moist copper cone about 3 feet high. A vacuum is created inside the cone, drawing the loose fur onto its surface. In less than a minute the cone is covered with a thin fabric of fur. The cone is taken from the dome, sprayed with hot water at 150° F., and the fabric is carefully removed.

At this stage of the process the hat body is a cone-shaped fabric 3 feet long and very delicate. Its texture is about that of wet blotting paper, and unless the body is handled with the greatest of delicacy it can be completely ruined. A procedure distressing to the company is that in which the thumbs of operators

(*Continued on Page* 30)





1. CUTTING
2. BLOWING
3. FORMING
4. SIZING
5. COLORING
6. PULLING OUT
7. BLOCKING
8. POUNCING
9. STIFFENING

Putting the Rabbit Into the Hat . . .

(*Continued from Page* 29)

are inadvertently pushed through the body at this stage.

Sizing—The formed cone, or hat body, is then processed through 7 or 8 machines known as sizing machines. The name derives from the fact that the function of the machines is to reduce hat bodies to the proper size. They apply hot water to the body and squeeze it through rollers until it has been "felted down" to about 1/3 its original size.

Operators Control Shrinkage

Although machines are used in the sizing operation, the shrinkage is largely controlled through manipulation by the machine operators. The degree of control of felting possessed by various operators is amazing, varying in the ratio of approximately 3 to 1. The most highly skilled sizers can perform in 3 hours the amount of work which the slowest take 8 hours to perform.

Coloring—Although some processes require that the fur itself be dyed before the hat body is formed, in most cases coloring is done midway through sizing. There are two reasons for this: First because better coloration results at this stage and second because further shrinkage is obtained during the coloring operation. In the coloring operation the hat body is given a two hour bath in hot dye to impart permanent and uniform coloration.

Stiffening—In this operation the lower part of the hat body, which eventually will be formed into the brim, is stiffened by the application of special stiffening materials.

Pulling Out—The hat body then goes through a machine operation in which the crown is "pulled out," and another in which the brim is pulled out. For the first time, the body takes on the recognizable shape of a hat.

Blocking—The body is then moistened with hot water or steam and is placed over a wooden block, on which it is shaped approximately to its final form. It is interesting to note that no hat body can be prepared without being "water blocked."

Pouncing—After the body dries it undergoes its first smoothing or rough "pouncing" operation in the machine which applies fine sandpaper very lightly to remove some of the roughness from the fur.

Stock Room—The hat body then goes to the body stock room. Here are stored thousands of dozens of hat bodies in every conceivable color, weight, quality, brim width, and shape. When a dealer's order is to be filled, stock room employees select the hat bodies that meet the dealer's specifications and send them along for the ensuing front shop operations.

Finishing—In this department, the hat is steamed and blocked to its final shape. The brim is trimmed, or "rounded," to the desired dimensions, and crown and brim are sponged and ironed to set the shape and tighten the body. The hat is given a beautiful smooth surface by alternate pouncing and applications of grease and powder. The edge of the brim is curled, either by hand or by machine, and the brim undergoes its first "flanging" operation, which sets its shape. This is done by placing the hat, upside-down, on a hollow wooden form which has a rim or "flange" of the desired shape. A large bag of heated sand is lowered onto the form, and within a few minutes the brim is moulded into the shape of the wooden flange.

Trimming—In the trimming room, the curled brim is bound, or, in the case of a welt brim, the curled edge is sewed down. The lining and sweat leather are cut to shape and sewed in. The band is put on the outside, along with any desired trimming like a bow, cord, or feather.

Flanging and Packing—In this department, the brim receives its final flanging and the hat goes through a "slick up" process. Although it has been inspected at every stage of the manufacturing process, the hat now undergoes a rigorous final inspection to insure absolute quality. The finished hats are then packed in boxes as specified by the customer.

Shipping—Here the various parts of the customer's order are brought together as they come through from the Packing Department, and the entire order is shipped out on the date and in the method specified by the customer.

There are about a dozen basic styles in men's hats. Each of these styles, however, is made up with many variations of brim, crown, and trim. The brim, for example, may have a raw edge, which means that the felt is not trimmed or bound in any way; or a bound edge, which means a ribbon binding is sewed around the edge of the brim; or a welt edge, which means that the felt is folded back onto itself and is stitched; or the brim may be stitched with a number of rows of silk stitching. The brim may be comparatively wide or fairly narrow; the crown may be straight or tapered, or it may be comparatively high or low, depending usually upon the width of the band with which it is trimmed.

Influenced Styling

The styling of men's hats in the United States was greatly influenced by the ideas of Mr. John B. Stetson, the founder of the John B. Stetson Company. In 1865, after returning to Philadelphia from a trip which his health forced him to take in the West, he set up a small hat business in a single room with $100 of capital. He bought what tools he needed, purchased $10 worth of fur, and began making felt hats. At first he copied the styles that were then popular, peddling his hats to the stores himself, one, two, or three hats at a time. Then he had another idea. "Why," he asked himself, "should I copy the styles of others? Why not originate the styles myself?" So he designed a hat that was slightly different and took it around to the dealers. They only laughed at him. Styles, they told him, were created in Europe, not in a rented room in Philadelphia.

So Stetson went back to the shop and made a hat of the finest, softest felt he could make—a hat that weighed only half as much as most felt hats then on the market. With this new hat cocked jauntily on his head, he went calling on a dealer. A customer who happened to be there bought the hat immediately, and the dealer ordered a dozen—Stetson's first big order.

Later, Stetson got the idea that was the turning point of his life. While out West he had made a crude hand-made utilitarian hat with a high crown which could be used to carry water for horses, and a big brim that could be used to fan a fire. Instead of depending upon

a limited local market in Philadelphia, with its narrow margin of profit, why not make a big, fine, picturesque hat for the Western Cattle Kings?

Designs Western Hat

And so he designed the famous hat he called "The Boss of the Plains." To obtain materials, he spent every last cent and borrowed money to the very limit of his credit. He got a list of all the clothing and hat dealers in the Southwest, and to every one of them he sent one of his big hats with a letter asking for an order for a dozen. Then there was nothing to do but wait—and hope. Back came the orders. One dozen. Two dozen. Cash in advance from dealers who wanted their orders filled first.

From then on the business grew just about as rapidly as Stetson could expand his manufacturing capacity. Stetson took hat making out of the one room work shops of individual hatters and made it into a business, a profession, an art, and a science. The name Stetson became synonymous with hat and is so listed in the Oxford-English Dictionary.

Within a few years after John B. Stetson introduced his "Boss of the Plains" hat in 1865, it had become the universal headgear of the West.

"Even by the '70s," reports *Time Magazine*, "thieves and rustlers who were shot and dumped into unmarked graves were later identified by the hatbands in their hats: one of Stetson's first tricks of merchandising was to stamp the retailer's name in the band in gold.

"Every cowboy, fake and real," says *Time*, "from Buffalo Bill to the Lone Ranger, wore a Stetson." After the Boer War, famed General R. S. S. Baden-Powell ordered 10,000 Stetsons for his South African police force, setting the style for thousands of police and military institutions to follow (including Canada's Mounties, the Texas Rangers, and Fiorello La Guardia).

The Indispensable Stetson

To the real, plains-riding cowboy, his Stetson was as much a part of his necessary equipment as his floppy chaps, his six-shooter, and his saddle. He seldom used the word "hat," because "hat" might mean some dinky little thing like a Derby or a Homburg. Instead, he referred to his "Stetson," because that word, to him, specifically meant the picturesque, wide-brimmed "ten-gallon" hat that all working cowhands wore. "Gonna buy me a new Stetson," he would say, or "Take off your Stetson and sit."

The word Stetson was so inseparably associated with the big "Boss of the Plains" hat that it was incredible to Westerners that any other type of hat could be a Stetson. W. C. Tuttle, famous writer of western thrillers, tells a true story of a cowboy who showed up in town one Sunday wearing, of all things, a Derby.

"It was a terrible faux pas," Tuttle relates. "The Derby was knocked off his head and cruelly mistreated. Later a cowboy picked up the wreck, holding it gingerly between his thumb and finger. Suddenly he squinted at the imprint on the sweat-band, and an expression of wonder flashed across his face. 'My God!' he gasped. 'It — it says "Stetson." I'll betcha it's a counterfeit. I'd jist as soon think of a bow and arrer bearin' the name "Colt" !' "

Stetson Means Hats

The word Stetson actually had a double-barreled meaning. It not only referred to a particular style of hat — it also referred specifically to a Stetson-style hat made by John B. Stetson. For the cowboy's hat was his companion, his trademark, the emblem of his success, and he wanted a good one. When he bought his hat, he'd ask for a "genuwine Stetson" and often he'd plank down twenty-five hard-earned dollars to get a really fine one.

And what a beating that hat would take! He wore it in the hot sun, in clouds of dust, in the driving rain. He used it to fan fires, to carry water, to flag the cattle into line during the round-up. At night, he often used it as a pillow. Next morning, he'd knock it back into shape, rub off a little of the dust with his elbow, and there it was, ready for another day.

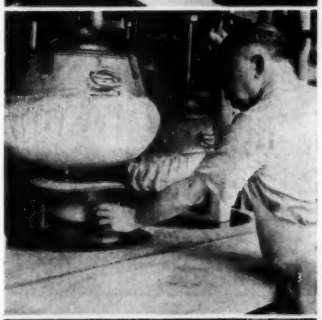
Clarence Mulford, author of the famous "Hopalong Cassidy" stories, describes a typical Stetson in one of his novels:

"It was trampled and soiled, and there was a fuzzy-edged rip an inch long where a 550-grain bullet had plowed before passing through. . . . Eight years before, Smitty had paid twenty-five dollars for that hat. It had seen hard service, but he fondly regarded it as being as good as new."

One Stetson has actually become indestructible. "On a trip to Arizona in 1901," *Time Magazine* relates, "John B. Stetson, Jr., son of the founder, tossed his well-worn Stetson into Fossil Creek, near the great Natural Bridge. Twenty years later the hat had turned into a 40-pound hunk of limestone, still shaped in the identifiable form of a

(*Continued on Page* 32)

1. FINISHING
2. TRIMMING
3. FLANGING
4. SHIPPING



Putting the Rabbit Into the Hat . . .

(*Continued from Page* 31)

Stetson. Manhattan's Museum of Natural History added the stone to its permanent collection."

Today the Wild West lives on in motion pictures, and with it, of course, goes the western-style Stetson. The late Tom Mix, who was a western sheriff before he became a movie star, always wore a specially-made Stetson.

Other famed stars of the past, like William S. Hart and Buck Jones, as well as such present favorites as Roy Rogers, Gene Autry, Ken Maynard and Tim McCoy, all wear modern versions of the famed "Boss of the Plains" hat.

However, whether your hat is a Derby, a smart snap brim, a Homburg or a "ten gallon," . . . remember that it all started with an unsuspecting little rabbit.

Look, Bright Eyes, that order was for a thousand Homburgs!

Personal

Miss Beatrice C. Horneman, President of the Business and Professional Women's Club of Evanston, is serving as chairman of the committee of the American Society of Landscape Architects, Inc., which is compiling data for a book to be published which will be entitled "Index to Works of Landscape Architecture in the United States and Canada." Miss Horneman will also edit this book after the data has been compiled.

Miss Horneman is Vice President of the Chicago chapter of this society, a member of the Western Society of Engineers, and is Landscape Architect for the Chicago Housing Authority.

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MEN AVAILABLE

CIVIL ENGINEER, engineering license plus advanced chemistry of sewage treatment, 39, 14 years' extensive and responsible experience service, operation, experimentation, construction municipal sanitation, water, pumping plants and tunnel construction. Presently employed. Chicago, California or Washington, D.C. 1-W

ARCHITECTURAL ENGINEER, licensed structural engineering architect, 46, 20 years structural engineering design, specifications, contracts for power stations, elevators, industrial buildings, warehouses. Presently employed. Desires ch. Structural, Consulting Engr. or Consultant industrial construction. Chicago or South. 2-W

ELECTRICAL ENGINEER, communications, 34, 7 years' design, production, customer contact on electronic and control transformers. 4 years' geophysical survey, computation. Presently employed. Desires Development, Sales Engr. in Communications, geophysical lab. instrumentation. Chicago, Texas, Rocky Mts. 3-W

ELECTRICAL ENGINEER, 49, extensive experience management design, construction; industrial, commercial, school; private, state and federal, including REA, electrical construction and manufacture. Desires Ch. Construction engr. electrical. Will relocate. 4-W

MECHANICAL ENGINEER, advanced optics, 30, 10 years experience precision optics and machine research, tooling, design, layout, construction connection with camera lens, and films on glass. Desires Chief, Production, Design, Optical Engineer or Factory Mgr. Optical, camera, instrument mfr. Will relocate. 5-W

MECHANICAL ENGINEER, cum laude, Ch. Engr. study, 33, 12 years experience product development, process, production planning, machine procurement and installation, design on light metal fabrication, tooling of telephone apparatus. Desires methods, production engr. light metal, electrical, automotive, refrigeration products. Will relocate. 6-W

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RESEARCH AND DEVELOPMENT (DIRECTOR) graduate, under 45, experienced in mechanical research, administrative, capable contacting top technical, operating and marketing personnel. Direct research division pumps, hydraulic hoists, refueling and bulk petroleum products equipment. $15,000-$20,000. Midwest. R-5025

SALES ENGINEER (combustion engineer) graduate mechanical engineer or electrical engineer, young, recent graduate on power plant experience. Will test coal in power plants, industrials and utilities. Salary approximately $3000. 50% travel out of Chicago 5 days a week. R-5277

DESIGNER (refrigerator cabinets) mechanical, under 35, several years' cabinet design. Carry projects with limited supervision. Approximately $5,000. Location: Northern Illinois. R-5274

INDUSTRIAL ENGINEER, 28-38, experience 5 years plus standards, incentives. Travel North America field assignments, each assignment averages 13 months. Dependents travel expenses plus moving allowance. 1st year averages $8600 plus insurance and retirement $1000-$2500 paid by company. Chicago. R-5183

SMPE to Meet

The Midwest Section, Society of Motion Picture Engineers will meet November 12th at 8 p.m. in the Large Auditorium of the Western Society of Engineers headquarters. The meeting is open to all who are interested in the program. The program consists of a presentation of National Carbon Company's new Technicolor film, "Carbon Arc Projection," by C. E. Heppeberger, lighting carbon technical specialist of that company, followed by a paper titled "A Discussion of High Quality Sound Reproduction" by John K. Hilliard, chief engineer of Altec Lansing Corporation, Hollywood.

The Carbon Arc film includes scenes showing the results of the first attempt ever made actually to photograph the action of the high intensity carbon arc.

Mr. Hilliard's paper outlines the requirements for high quality sound reproduction from both the subjective and the objective standpoints, and it is to be followed by a general round-table discussion by Chicago experts in the field of sound reproduction.

Audience participation in this portion of the program is both solicited and recommended.

Further information regarding the program may be obtained by calling the SMPE Midwest Section chairman, R. T. Van Niman, ES tebrook 8—6600.

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A.I.E.E.

Education Program

The Chicago Section of the American Institute of Electrical Engineers announces the 1948-49 Educational Program which is open to members of the Western Society of Engineers, the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and to the public. All members of these organizations are eligible to enroll in the courses at member rate.

These courses are offered primarily for the professional engineer, who being out of school does not have the opportunity to attend regular college classes. The program is in no sense meant to compete with the excellent engineering and technical schools in the Chicago area.

Four courses are scheduled, with classes beginning on October 12th at the Western Society headquarters. In the field of human relationships, a course in Principles of Supervision is being added to complement the Business Relationships course which is being repeated. The English courses are being expanded to include two eight-session courses; one in Business English and Letter Writing, and the other in Report Writing.

The Chicago Bar Association is cooperating in the planning of a course in law concepts and fundamentals to be given in the spring.

COURSE NO. 1

THE PSYCHOLOGY OF GETTING ALONG WITH PEOPLE IN THE BUSINESS WORLD

Five Sessions

This is the fundamental course which was given three times last year. It deals in basic principles of achieving mutually satisfactory working relationships. The instructor is again Mr. W. K. Burchard, head of the Engineering Training Department of the Illinois Bell Telephone Company.

Time: Tuesday evening, 7 to 9 p.m., October 12 to November 9, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

COURSE NO. 2

BASIC PRINCIPLES OF SUPERVISION

Eight Sessions

This course deals in the theory of supervision emphasizing personnel factors rather than the technical. It will include such subjects as job planning, handling cases of dissatisfaction, improving individual production, and safety. The instructor is Mr. W. K. Burchard, Illinois Bell Telephone Company.

Time: Tuesday evening, 7 to 9 p.m., November 16 to January 4, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

COURSE NO. 3

BUSINESS ENGLISH AND LETTER WRITING

Eight Sessions

A comprehensive course devoted to a review of grammar, punctuation, and diction as related specifically to business letter writing. At least half of the sessions will deal with actual business letters—their form, style, and content. The course is an expansion of the one presented last spring. Mr. H. E. Clarkson, Northwestern University instructor, business letter consultant, and lecturer, will again be the instructor.

Time: Wednesday evening, 7 to 9 p.m., October 13 to December 1, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

COURSE NO. 4

REPORT WRITING

Eight Sessions

An eight-week course dealing in the functions, forms, content, and preparation of the various types of reports. This course will be presented immediately following the conclusion of the Business English and Letter Writing course. Mr. R. C. Gerfen, also a member of the faculty of Northwestern University will be the instructor. Mr. Gerfen worked with Mr. Clarkson in the presentation of the combined Correspondence and Report Writing course given last spring.

Time: Wednesday evening, 7 to 9 p.m., December 8 to January 26, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

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General Education Committee

A broad, non-technical program of instruction in human relations and business principles is the aim of a plan recommended by the General Educational Committee of the four founder societies and the Western Society of Engineers.

The committee recommends that the scope of the educational program include effective self-expression by speech and writing; training in the economic and business structure of the country; the tools used in setting forth costs and other financial data; and understanding of the bases of human behavior.

This would provide engineers with basic concepts and tools in the humanistic-social area comparable to the mathematics and physical science which are fundamental to their technical work.

This is approximately the material encompassed within the non-technical features of the various tentative six-year college engineering courses, to the extent that these can be conducted within the means of the probable participants.

The preliminary work such as determination of subjects, appointment of teachers, handling of funds, etc., to assure that the project will continue year after year, would be in the hands of a permanent General Educational Program Committee. The committee will be composed of two members from each of the four founder societies and of the Western Society of Engineers, to be appointed for staggered two-year terms.

Paid Secretary Would Direct

Administration of the courses would be directed by a paid secretary whose compensation, as well as other expenses of the program, would come from the tuition charges of all the courses. This secretary would, however, be responsible to the direction of the committee.

The educational program of the A.I.E.E., as listed on page 34, would constitute an immediate start toward the objectives.

The broader program would provide that courses be conducted on a completely self-sustaining basis, open by invitation to all engineers with one common fee for members of the four founder societies and the Western Society of Engineers, and double this fee for all other participants.

Would Conduct Refresher Course

In view of a general demand, a refresher course for Professional Engineers who need to take the State examinations required for registration, would be started as soon as possible. The committee felt that this course, falling outside of the general educational program, should probably be conducted by the Western Society of Engineers. For this course, however, it was suggested that one common fee, based on actual costs, be charged to all participants. The committee recommends that the course be started this fall in time for the May 1949 examinations.

English

Specific course recommendations are as follows:

1. *English,* plus specific training in the writing of engineering reports of the type which aims to teach the individual to say and write what he means, concisely and with a purpose, and to read and listen with precise understanding and discrimination. This can employ contemporary American periodicals and books to afford practice in the kinds of expression which engineers will be called upon to use most often.

   Further instruction on one or all of the following should be considered:

   (a) *Literature* to aid in the development of style, to stimulate the imagination, and to promote insight into character.

   (b) *History (and Philosophy) of Science* which should lead to appreciation of the scientific spirit and understanding of the historical point of view.

   (c) *History of American Institutions* to cultivate an attitude of mind in which immediate business problems are considered in terms of their broader setting; it should make clear the course of intangible and nonlogical factors in great political decisions, a view rarely part of the young engineer's thinking; it should arouse a sense of the responsibility of citizenship and of the gravity and urgency of the problems of today.

Economics

2. *Economics, Basic Principles and Problems,* to provide understanding of the general economic structure, its strength and weakness in meeting the economic needs of the country; knowledge of the basis of corporate enterprise, its obligations to the public, employees and investors and of the relations between earnings and survival; and familiarity with the rise of labor organizations, their objectives and functioning.

   Further instruction in one or both of the following also is recommended:

   (a) *Industrial Organization, Finance and Management,* a study of corporation finance and the principles of management control through line and staff organization.

   (b) *The Labor Movement and Industrial Relations* problems, the development of the labor movement, primarily in this country, its current forms and objectives, labor laws, purposes and general methods of personnel in industry, problems of industrial relations.

Accounting

3. *Principles of Accounting and Elements of Statistics* to provide, not only basic principles, but consideration of costs on a present worth basis, annual charges and depreciation, emphasizing the importance of these financial elements in every engineering problem.

Psychology

4. *Bases of Human Behavior,* principal determinants, normal and abnormal behavior, individual differences, effect of modern environment, learning, organized thinking, group psychology.

Future Events

Junior Division To Meet December 2

The Junior Division will hold the second of its scheduled seminar-type meetings Thursday, December 2, 1948, at 7:00 p.m., in the WSE headquarters. The topic for this meeting will be "U. S. Patent Law."

Mr. William A. Snow, partner in the firm of Rummler, Rummler and Snow, specialists in patent and trademark law, will lead the discussion on "Inventions and Patent Law," and members of the group will be invited to take part.

The speaker is on the faculty of the John Marshall Law School and also on the faculty of the Harty Law Review Course.

This discussion will be of special interest to young engineers. All members of the Junior Division and their friends are invited to attend.

Rendezvous Dinners

Arrangements have been made with the Blackhawk Restaurant, corner of Randolph Street and Wabash Avenue, to hold Western Society's Rendezvous Dinners preceding scheduled meetings, in the Indian Room. Dinners will range from $1.50, and accommodations for 35 persons can be assured with 48 hours notice. Contact Mrs. Brown or Miss Henkel at RA ndolph 6—1736.

TESTING

American Society for Testing Materials, Technical Committee on Petroleum Products and Lubricants, will meet November 13-16.

RAILROAD

"The Illinois Terminal Railroad" is the subject of a paper to be presented by Mr. E. E. Kester, Passenger Traffic Manager of the road, before a joint meeting of the Chicago Chapter of The Railway & Locomotive Historical Society and The Central Electric Railfans' Association, November 12, 1948. Members of the Western Society of Engineers are invited.

ENGINEERS AND EXECUTIVES

On November 17, 1948, Mr. O. Gressens, Vice-President and Comptroller, Illinois Northern Utilities Company and the Commonwealth Edison Company, will discuss "Profits by Departments," at a meeting of the Institute of Industrial Engineers and Executives at 8 p.m. in Abbott Hall, Northwestern University campus.

ELECTRICAL

Dr. Winston E. Kock, Engineer in Charge of Acoustics, Transmission Research Department, Bell Telephone Laboratories, N. Y., will speak before the Communications Group of American Institute of Electrical Engineers on November 18, 7 p.m., at WSE headquarters. His subject will be "Broad Band Microwave Lens Antennas."

REFRIGERATION

American Society of Refrigerating Engineers will hold its 44th annual meeting, at the Hotel Statler, Washington, D.C., December 5 through 8.

Fifteen technical papers, conversing such subjects as food freezing, and refrigeration design developments will be presented.

Women's Council Meets November 11

Speaker at the next meeting of the Women's Division on Thursday, November 11, will be Miss Mary Murphy, Secretary of the Professional Women's Council. She is associated with Bell Telephone Company.

The Division has chosen a new plan for meetings. A Rendezvous Dinner will be held at 5:45 p.m., with a Business Meeting following at 7 p.m., and a program following. A member of the group will speak on a technical subject at 8 p.m. with a question and answer period following from 8:30 to 9 p.m. All members of Western Society are invited to attend the program beginning at 8 p.m.

The Professional Women's Council adopted its Constitution and By-Laws on Friday, October 15. They will now be submitted to the Amendments Committee of Western Society for approval.

ASME Annual Meeting

The 69th Annual Meeting of The American Society of Mechanical Engineers, will be held in New York November 28 through December 3, with headquarters at the Hotel Pennsylvania.

Nearly 200 technical papers will be given. These will deal with such diversified subjects as gas turbines, supersonic flight and rocketry, developments in rubber, plastics and textiles of the past year, safety boiler codes and pressure vessels, new metals techniques, and the science of prosthesis—the design and fitting of artificial limbs. "Opportunity for and Responsibility to the Young Graduate Engineer" is the keynote of the meeting.

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Western Society Meetings

Mechanical

Speakers at the NOVEMBER 15 meeting of the MECHANICAL ENGINEERING SECTION, will be Dr. Frank D. Carvin, Director of the Department of Mechanical Engineering, at Illinois Institute of Technology, and Wilson P. Green, Professor of Mechanical Engineering, and Director of the Engine Noise Research Laboratory at I.I.T. Their subject will be "Noise Reduction of Industrial Machinery."

They will present a discussion on the general approach to the problem of noise abatement based on the researches conducted in the Engine Noise Laboratory. Modern methods and techniques used in locating, measuring, and reducing noise levels in machinery will be discussed. The talk will be illustrated by slides and recordings of an experiment made on noise reduction of a gasoline engine.

Dr. Carvin received his B.S. in M.E. and the M.E. degrees from the University of Pennsylvania and the M.A. and Ph.D. degrees from Columbia and New York Universities, respectively. He has been teaching for 30 years, and is a consulting engineer, holding professional licenses in New York and New Jersey.

Prof. Green received his B.S. in M.E. at the University of Florida, and the M.S. in Engineering from the same institution. From 1938-46 he was Associate Professor of Mechanical Engineering in charge of Engine Research and War Training Program at the University of Maryland, and since 1946 has been associated with I.I.T. He has numerous publications in the field of Refrigeration and Internal Combustion Engines, and has served as consultant to the National Education Association, the M.X. Wilberding, and the Armour Research Foundation.

Chemical & Metallurgical

Mr. C. Martin Riedel, senior partner of the Chemical Soil Solidification Company, will speak at the NOVEMBER 22 meeting of the CHEMICAL AND METALLURGICAL ENGINEERING SECTION on the subject, "Practical Applications of Soil Consolidation Methods." He will touch briefly on the development of various methods and dwell principally on industrial applications. The lecture will be illustrated with 20 or 30 slides to show how the methods have been applied in Hydro-Electric Structures, railway, mining and municipal works.

Mr. Riedel received his civil engineering degree from the Royal Polytechnic Institute of Dresden in 1921, and has been active in the practice of his profession in this country since 1922. He was with Harrington, Howard and Ash Company of Kansas City, Missouri, until 1925, when he joined the City of Chicago, Filtration Plant Design force where he is still employed.

He is a member of the American Society of Civil Engineers, and the American Water Works Association. In 1945 he was awarded the John M. Goodell prize by the A.W.W.A.

Gas Fuels and Combustion

The NOVEMBER 29 meeting of the GAS FUELS AND COMBUSTION ENGINEERING SECTION will feature Dr. A. D. Singh, president of Singh Company, who will speak on the fluid devolitalization of coal, the process and equipment. He will bring up to date the progress that has been made on this subject over that presented in his paper given June, 1947, at the Semi-Annual Meeting of the American Society of Mechanical Engineers here in Chicago.

Dr. A. D. Singh

His company is planning to build a pilot plant, and possibly commercial plants for the fluid devolitalization of coal. His prior experience in the field includes his work with the University of Illinois Engineering Experiment Station, where considerable research was done in the recovery of SO_2 gases from stacks in industrial furnaces. Previous to this he was actively engaged in the atmospheric pollution studies for the Smoke Abatement Group for the City of Chicago, and other interested municipal and state bodies.

WSE Headquarters Calls

In order that Western Society members may receive faster and more accurate service as well as quicker attention to inquiries, we suggest that telephone calls be directed as follows:

Membership dues and fees, contributions, bills and general bookkeeping inquiries are handled by: MRS. DORIS BROWNE.

Membership applications, references, admissions, pins and certificates, notices of committee meetings, and general membership service, call: MISS MARGARET HENKEL.

Questions about the Yearbook, or the WSE library will be answered by: MISS ELIZABETH BRILL.

Changes in address and mailing problems are handled by: MISS MARY WENDELL.

Problems relating to MIDWEST ENGINEER, including deadlines, articles and news stories, editorial and advertising layout, and related matters is the responsibility of the Production Supervisor, MRS. BARBARITA ANDREWS.

Inquiries for all meeting dates, program arrangements, advertising rates, headquarters facilities and over-all policies should be directed to: MR. DONALD V. STEGER, Executive Secretary.

WSE Calendar

1948

November 8	General meeting sponsored by Hydraulic, Sanitary & Municipal Engineering, and Traffic Engineering and City Planning Sections
November 15	Mechanical Engineering Section
November 22	Chemical and Metallurgical Engineering Section
November 29	Gas, Fuels and Combustion Engineering
December 6	Hydraulic, Sanitary and Municipal Engineering Section
December 13	General meeting sponsored by: Mechanical Engineering and Fire Protection and Safety Engineering Sections

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WSE Applications

In accordance with the By-laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Junior, Member, Associate, etc.

All applicants must meet the highest standards of character and professionalism in order to qualify for admission, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office.

Applications PRESENTED to the Board of Direction at its meeting October 28, 1948.

No. *Name* *List No. 4. C. (1)*

72-80 Joseph F. Wisner, Jr., Student, International Harvester Co., 2600 W. 31st Blvd.

73-80 Soren Einar R. Lindberg, Struct'l Detailer, Burlington Railroad Company.

74-80 Clarence N. Lauritsen, Div. Operating Supt., Public Service Company of Northern Illinois, 72 W. Adams St.

75-80 John F. Starkovich, Chief Elect. Engr., Janette Mfg. Co., 556 W. Monroe St.

76-80 Laddie A. Sanda, Design Engr., Soreng Mfg. Corp., 1901 N. Clybourn Ave.

77-80 John W. Wade, Vice Pres., John Griffiths & Son Construction Co., 228 N. LaSalle St.

78-80 Arthur H. Wells, Pres., John Griffiths & Son Construction Co., 228 N. LaSalle St.

79-80 Edward Custer (Rein.), Struct'l Engr., Sargent & Lundy, 140 S. Dearborn St.

80-80 George G. Keyes, Development Engr., Teletype Corp., 1400 W. Wrightwood Ave.

81-80 William D. Shipman (Rein.), Engr., Macdonald Engineering Co., 188 W. Randolph St.

82-80 Leo R. Idaszak, 2026 W. Webster Ave.—attending Illinois Institute of Technology.

83-80 Frank A. Mattausch, 2803 Ezra Ave., Zion, Ill.,—attending Illinois Institute of Technology.

84-80 Keith E. McKee, R. R. 1, Box 76, Chicago Heights, Ill.,—attending Illinois Institute of Technology.

85-80 Alan L. Morrison, 2145 Lunt Ave.,—attending Illinois Institute of Technology.

(Continued in December MIDWEST ENGINEER)

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MEMBERSHIP COMMITTEE PLANS FOR YEAR

A review of the progress made and the final plans for the activities of the membership committee were made at a meeting held October 20.

The plans for this year consider each member of the Society to be a working member of the committee. A membership application blank along with a brochure that summarizes the aims and advantages of the Society has been sent to each one in order that he will be fully equipped to do his part in attaining the objective of 600 new members this year.

Now, with most of the year's activities still ahead, is the time to contact prospective members. Delay means more of this year's programs will be missed by a new member.

A start to this year's goal has been made with the 98 membership applications received to date.

Necrology

M. P. Vore

Western Society was shocked to learn of the death of its Treasurer, Mr. M. P. Vore, Jr., on the morning of October 19.

Mr. Vore had been a member of the Society since 1919, serving actively as a Director and member of the executive committee of the Mechanical Engineering section. He also served on the Entertainment and Excursion committee, Cooperative Relations committee, Attendance committee, Publications committee, and was chairman of the Mechanical section during 1946-47.

Mr. Vore worked conscientiously as Treasurer of the Society, and was instrumental in modernizing and streamlining its accounting methods.

BALDWIN

George Crook Baldwin, construction superintendent of the Public Service Company of Northern Illinois, died October 2 of a heart attack. Mr. Baldwin had been associated with the utility company for 25 years. He became a member of Western Society in October, 1947. He had been extremely active as a member of the Executive Committee as program representative on the Gas, Fuels and Combustion Engineering Section.

MEAD

Dr. Daniel W. Mead, one of the oldest living members of Western Society, died October 13, at Madison, Wisconsin.

Dr. Mead was born at Fulton, New York, on March 6, 1862. He graduated from Cornell University in 1884 with the degree of Bachelor of Civil Engineering and in 1932 was honored with the degree of Doctor of Laws at the University of Wisconsin, where he founded and headed the Department of Hydraulic Engineering in the School of Engineering at the University of Wisconsin for 27 years.

He became a member of WSE in 1887 and was a Life Member and an Honorary Member at the time of his death. He was the recipient of the Washington Award and the Chanute Award.

LYNCH

William J. Lynch, head of a contracting firm bearing his name, died September 13. He had been a member of Western Society since January, 1920, and had been active on several committees.

KENNEDY

C. J. Kennedy, engineer with the Gary plant of American Bridge Company, died in August, according to word just received from his wife. He had been a member of Western Society since March, 1946, and was active in committee work.

He was Secretary-Treasurer of Republic Flow Meters and a member of the Board of Directors of the company, serving in the same capacity with Autogas Company.

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Charles Ellet Award

After a wartime lapse of nearly 8 years, the Junior Division has announced resumption of the annual Charles Ellet Award. Competitive papers for this award will be presented orally before the WSE membership in the WSE headquarters, Thursday, February 3, 1949. The winning contestant will later be formally presented with the Charles Ellet Award at the annual WSE dinner meeting to be held on Monday, June 6, 1949.

The award was established in 1929 by a gift from E. C. Shuman, a Junior member, who suggested the name "Charles Ellet Award" as a memorial to a courageous young engineer of Civil War days. A silver loving cup with each recipient's name and alma mater engraved, is presented to the winner, and is kept on display in the Society headquarters. As evidence of the honor, the winner receives an engraved certificate and an award of $25.00.

The award is made annually to a Junior member who, in the opinion of a committee of awards, is adjudged to have excelled in the preparation and presentation of a semi-technical paper presented in competition for this award at a meeting of the Junior Engineers.

The paper should present a lay-treatment of a semi-technical subject. Objective, but complete, coverage rather than complex formulae and derivations is desired.

There is no restriction or limitation on the choice of subject for this paper. Judging, however, will be performed by a 5-man award committee giving equal weight to each of the following five (5) points:

(1) Timeliness of the subject.
(2) Engineering application of the subject.
(3) Knowledge of the subject.
(4) Preparation of the paper.
(5) Presentation of the paper.

The paper should be typewritten, double spaced, less than 2000 words and submitted in triplicate to the Charles Ellet Award Committee not later than January 10, 1949. Although submitted in writing, the paper must be presented orally, and not read verbatim, at the competitive meeting. Charts, diagrams or other visual aids which assist in the presentation of the subject should, of course, be used wherever necessary and should be incorporated in both the manuscript and the oral presentation.

It should be noted that the contestant will be judged both on the written paper and the oral delivery.

The winning paper, and those of special interest to the membership will be presented in the MIDWEST ENGINEER at a later date.

Previous recipients of this honor have been:

1930—John D. Burlie, Purdue University
1932—Francis E. Wolosewick, Armour '27
1933—Joseph Kucho
1934—Irving J. Kadic, Chicago Tech. '27
1935—Grover C. Lewis, Illinois '30
1936—Robert W. Suman, Armour '34
1937—George A. Nelson, Armour '35
1939—Raymond V. McGrath, Univ. of Wash. '35
1940—Ray F. Erickson

All Junior members (28 years of age and under) are urged to file notice with the secretary's office and prepare a paper for this competition. Intention to compete for this award should be forwarded to the Junior Division Program Committee not later than December 5, 1948, so as to facilitate necessary publicity and scheduling for the competitive meeting February 3, 1949.

Further inquiries concerning the Charles Ellet Award will be welcomed at the Society Headquarters.

Juniors Hold First Meeting

The first Fall meeting of the Junior Division on October 5, continued the sequence of the seminars which proved so popular and successful last year.

William Harrison and James Fairchild of Social Research Incorporated spoke briefly and then guided a lively discussion on the theme, "So You Want To Be A Boss."

The most important and predominating traits usually found in a successful executive were outlined by Mr. Fairchild. The existence of these qualities was revealed in extensive executive sampling research conducted by Social Research Incorporated. The predominating traits and qualities include: a passion for achievement, concept of authority, mobility drive, organizational ability, ability to make unwavering-firm decisions, "knowledge of what one wants and how to get it," active personality, fear of failure, strong sense of reality, and . . . jokingly . . . ulcers.

Mr. Harrison described how these traits could be detected in potential executives by means of an apperception test in which the person being tested gives his interpretations of a series of ten scientifically selected pictures. These interpretations are analyzed by psychologists.

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1948-49 Yearbook Edition

In past years the Yearbook of the Western Society of Engineers has been a pocket-size publication containing the names of the members of the Society and other pertinent data. Advertising has been in the back of the magazine.

Beginning this year, the Yearbook will be the same size as MIDWEST ENGINEER and will use a similar format. Ads will be interspersed throughout the pages. Advertising rates are the same as for the MIDWEST ENGINEER—a real bargain for space in a permanent reference book used frequently throughout the year by all WSE members.

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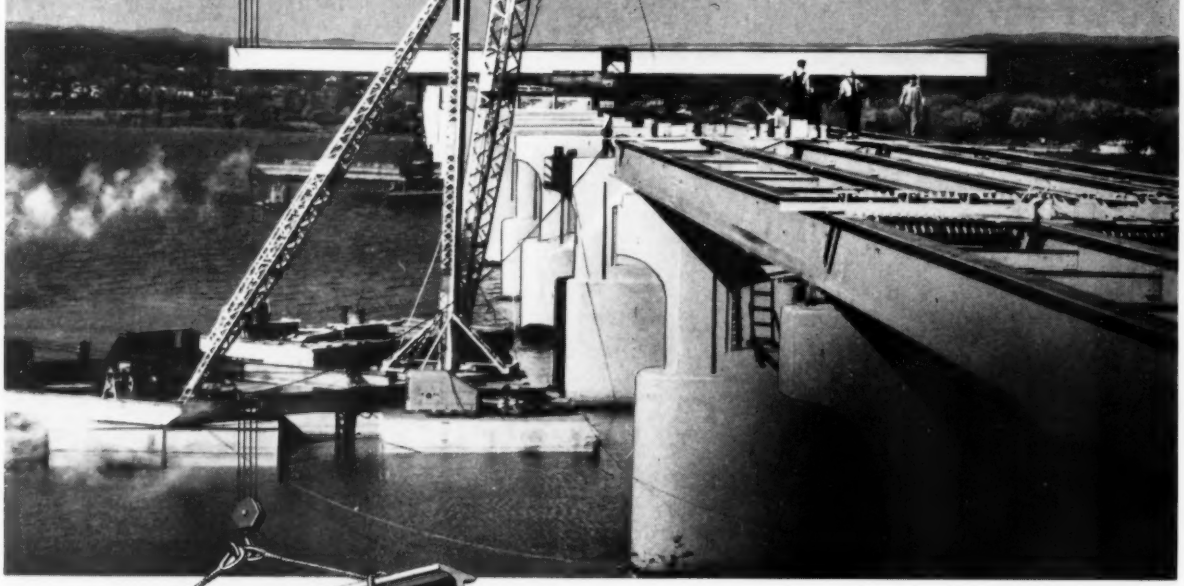

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